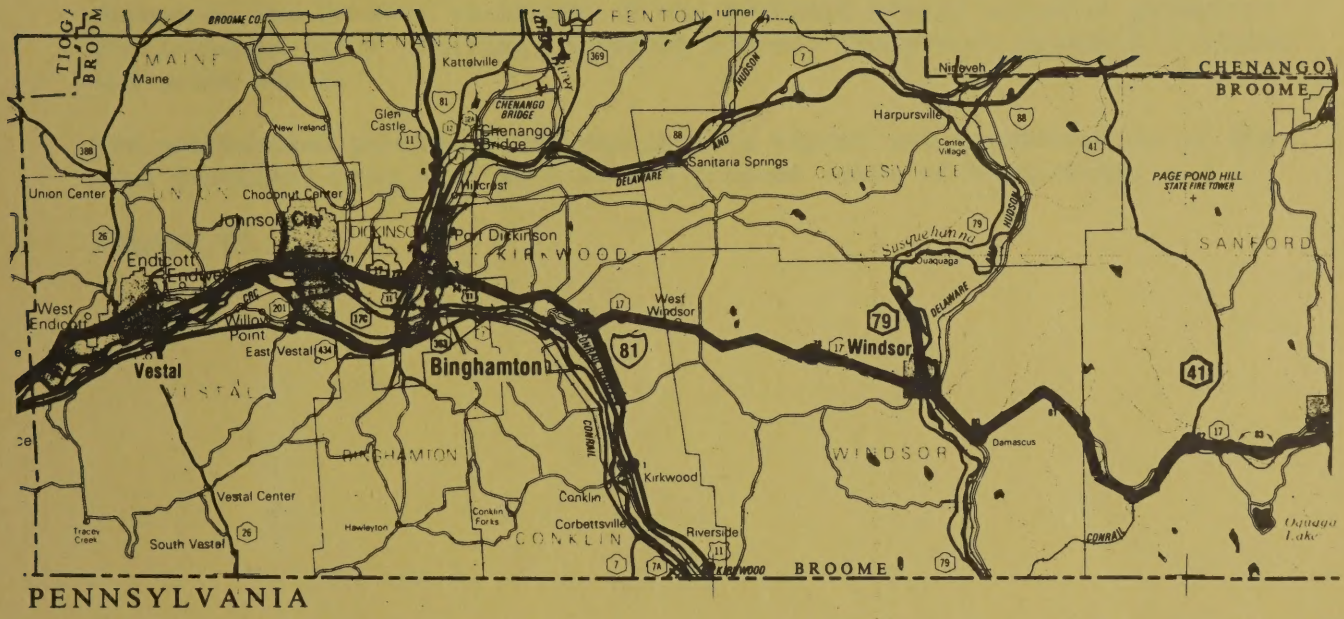

Roadway Condition Report
Route 17 in Broome County

March 1983

MEMORANDUM
DEPARTMENT OF TRANSPORTATION

DATE March 10, 1983

SUBJECT ROADWAY CONDITION REPORT
ROUTE 17 IN BROOME COUNTY

FROM L H. Moore, Technical Services Division, Rm. 210, Bldg. 7A L.H.M.

TO James K. Connors, Regional Director of Transportation, Region 9

All of Route 17 in Broome County has been evaluated by personnel from the Regional and Main Office Technical Services Division. Emphasis was placed on the present condition of the Portland cement concrete pavement; particularly joint faulting, pavement blowup, transverse pavement cracking and joint seals.

The recommended problem solutions in this report are considered to be the most practical ones available at the present state of technology.

LHM/WPM/EB

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I. INTRODUCTION

A joint Regional-Main Office Technical Services group has made an evaluation of all of Route 17 in Broome County. The investigation included a review of the as-built contract plans, field inspections and shoulder coring.

Route 17 in Broome County is approximately 42 miles long. This four lane divided pavement is 9 inch thick reinforced Portland cement concrete with transverse joints at nominal 60 or 100 foot spacing. Many joints have a two component load transfer device. This portion of Route 17 was constructed under 9 contracts that were let between 1953 and 1968. Many of these pavement sections have reached or exceeded their design life. Some have been overlaid with asphalt concrete or are being planned for some rehabilitation work in the near future.

This report identifies existing major problems and recommends potential solutions for them. The report is sufficiently detailed to allow development of a strategy for the maintenance of pavement rideability and the prevention of further deterioration. Additional investigations will be necessary for any subsequent design work for rehabilitation contracts.

We would like to express our thanks to the following Regional Personnel for their participation in this project.

Participants

Roy Bailey
Richard Calabrisi
James Dempsey
Charles Donahue
William Orshal
George Savage
Albert Ucker

II. BACKGROUND INFORMATION

New York State has many miles of 9 inch thick Portland cement concrete pavement which has reached or exceeded its design life. Much of this pavement has a two component type load transfer device. This load transfer device deteriorates with time resulting in variable degrees of pavement faulting.

This problem was thoroughly investigated and reported in the publications entitled "Portland Cement Concrete Pavement Performance - Interstate 84, Pennsylvania State Line to Connecticut State Line" dated March 1978 and "Roadway Condition Report - Route 17 in Sullivan County" dated September 1979.

III. OBSERVATION OF GENERAL ROADWAY CONDITIONS

Prior to making a field inspection of the roadway, the original construction contract limits, pavement and shoulder details and geometric data were obtained from the record plans. The Pavement Rideability Index (PRI) values from the 1981 Survey were also obtained.

Between June and October 1982, several inspections of Route 17 were conducted. Materials Bureau personnel were primarily concerned with the pavement conditions and Soils Bureau personnel were primarily concerned with the shoulder, earth and rock slopes, and surface drainage conditions. Shoulder cores were taken at random locations to determine the materials presently in place. Engineering Geologists from the Soil Mechanics Bureau inspected all the rock cut slopes.

The information gathered from the above activities is presented separately for each original construction contract. The preliminary rock cut slope recommendations and the shoulder core records are located in the Appendix.

Remedial earth slope treatment and edge drain applications have not been addressed in this report. These considerations should be dealt with during the design stages of any particular project.

IV. PAVEMENT DEFICIENCIES

The PCC pavements evaluated fall into three categories:

Category 1

Older pavement built a lane at a time with 95-100 foot long slabs and hand formed transverse expansion joints sealed with a hot poured bituminous sealer. Almost all of this type pavement has been overlayed with bituminous concrete.

Category 2

Pavement built one or two lanes at a time with 60 foot - 10 inch long slabs and formed or sawed transverse contraction joints sealed with either a liquid or 13/16 inch or 11/16 inch wide preformed neoprene sealers.

Category 3

Newer pavement built one or two lanes at a time with 60 foot - 10 inch long slabs and sawed transverse contraction joints sealed with 1-1/4 inch wide preformed neoprene sealers.

The deficiencies common to pavements within these categories are:

Category 1 - (not overlayed)

- Major spalling at transverse and longitudinal joints.
- Wide working transverse slab cracks.
- Longitudinal joint separation.
- Failed joint sealers.
- Existence of maintenance patches of various ages and conditions.
- Loss of original texture in the wheel tracks of the driving lane.
- Wheel track ruts due to wear.

Category 1 - (overlayed)

- Unsealed single or multiple reflection cracks over underlying longitudinal and transverse joints and cracks.
- Loss of overlay (raveling and/or potholing) in some areas where multiple reflection cracks have developed.
- Occasional upheaval from movement of underlying PCC pavement slabs.
- Minor wheel track rutting of the surface in the driving lane.

Category 2

- Objectionable faulting at transverse joints (3/16 of an inch or greater).
- Minor to major joint spalling at longitudinal and transverse joints.
- Wide working transverse slab cracks over cross culverts and where subbases have been weakened from excessive moisture.
- Some longitudinal joint separation.
- Failed joint sealers.

- Existence of maintenance patches of various ages and conditions.
- Loss of original texture in the wheel tracks of the driving lane.
- Occasional pavement blowup.
- Wheel track ruts due to wear.

Category 3

- Objectionable faulting at transverse joints (3/16 of an inch or greater).
- Minor joint spalling at longitudinal and transverse joints.
- Joint sealers beyond serviceable life.
- Loss of original texture in the wheel tracks of the driving lane.

V. RECOMMENDED SOLUTIONS FOR CORRECTING DEFICIENCIES

Following are the recommended solutions for correcting the deficiencies found in each of the three categories:

Category 1 - (not overlayed)

The only effective way to rehabilitate a pavement with deficiencies of this magnitude is to overlay it with dense asphalt concrete. Before this is done, however, the following should be accomplished:

- Replace structurally unsound PCC slabs with a full depth bituminous repair consisting of dense base or binder. The cause of the condition, for example water problems, should be corrected first.
- Provide full depth, full width pressure relief joints at existing blowup locations consisting of dense base or binder.
- Remove all loose spalls and maintenance patches, thoroughly clean the exposed voids, tack coat the voids and fill and compact with dense bituminous concrete.
- Clean and seal all longitudinal and transverse joints and cracks in accordance with Section 633 of the Standard Specifications.
- Clean and tack coat the existing PCC pavement.
- Saw and seal transverse joints in the overlay if applicable (see EI 82-62).

Category 1 - (overlayed)

The overlays evaluated are in relatively good condition at this time, exhibiting only minor deficiencies. The following remedial actions are recommended to extend the serviceable life of these overlays.

- Clean and seal longitudinal and transverse reflective cracks.
- Clean, tack and patch excessively raveled and potholed areas with bituminous concrete.
- Remove loose pieces of overlay. Clean, tack and patch the voids with bituminous concrete.
- Where upheavals have occurred, remove the overlay and any underlying pieces of loose and/or deteriorated PCC pavement. Clean, tack and patch the voids with bituminous concrete.

Category 2

The PCC pavements in this category exhibit deficiencies of sufficient magnitude to warrant rehabilitation. Restoration can be achieved by either overlaying with bituminous concrete or by diamond grinding and patching. Based on experience to date, the cost benefit relationship of the two appear to be equal. From a first cost standpoint, overlaying is more expensive. However, it extends the serviceable life of the pavement longer since diamond ground pavements do refault. Neither attacks the root cause of joint faulting which is loss of load transfer.

If an overlay is chosen, the preliminary repairs to the PCC pavement prior to overlaying, as outlined in Category 1 (not overlayed) also apply here.

If grinding and patching is chosen, the recommended procedure is:

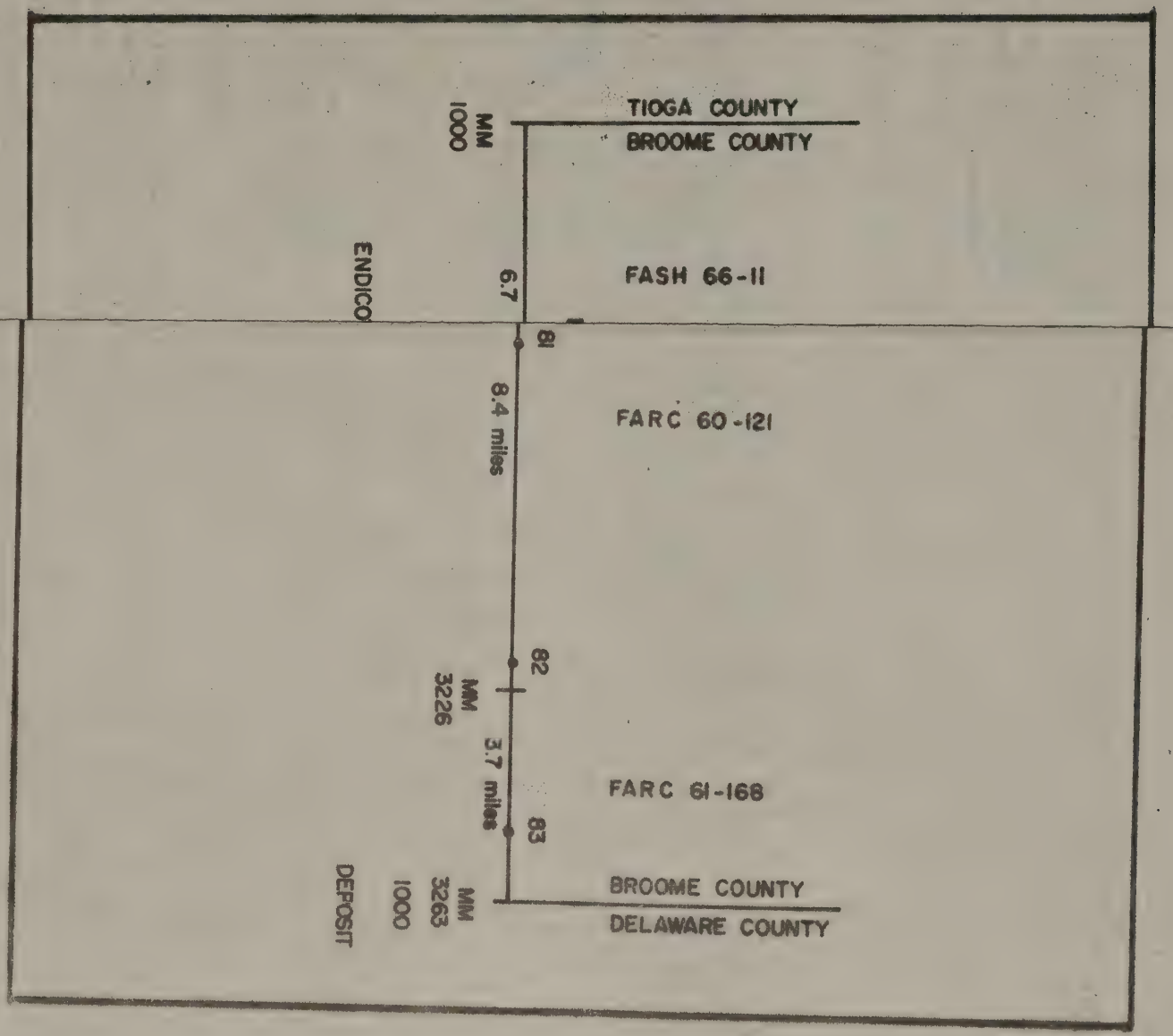
- Replace structurally unsound PCC slabs with a full depth bituminous repair consisting of dense base or binder after correcting the cause of the condition.
- Provide full depth, full width pressure relief joints at existing blowup locations consisting of dense base or binder.
- Diamond grind the required depth to remove the faults.
- Remove all spalls and maintenance patches down to sound concrete. In doing this, any reinforcement exposed should also be removed.
- Thoroughly clean the exposed surfaces of the voids by sandblasting.
- Fill the voids with either $CaCl_2$ accelerated set concrete, Set 45 or polymer concrete.
- When patches occur at a joint, saw new transverse or longitudinal joint grooves as soon as possible to eliminate "bridging" of the repair material and to also provide a reservoir for a joint sealer.
- Sandblast the new joint grooves before sealing.
- Sandblast, clean and reseal all the other remaining longitudinal and transverse joints and cracks.

Category 3

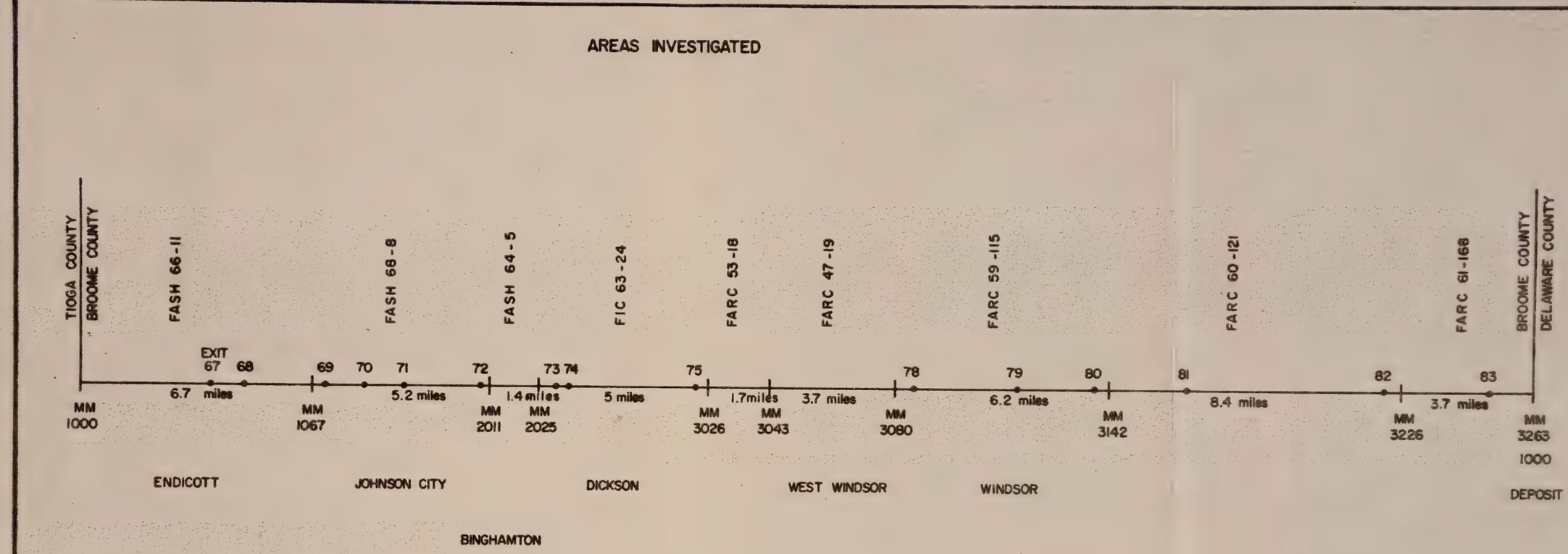
- The PCC pavements in this category exhibit only one major deficiency which is transverse joint faulting. This can be corrected by either overlaying or diamond grinding as described under Categories 1 and 2. The only other deficiency found of any significance was that the preformed neoprene sealers have exceeded their serviceable life and should be resealed after grinding. Minor joint spalls should also be patched as part of the grinding and resealing.

In conclusion, all of the above recommended solutions have been used to rehabilitate other highways throughout the State. Consequently, specifications for the repair methods described, are available. Further details concerning these repair methods and specifications can be obtained from either the Materials or Soil Mechanics Bureau. Presently, other means of rehabilitating PCC pavements are being studied which include experimental installations of bonded PCC overlays and inlays and retrofit load transfer devices which are intended to restore load transfer, thus preventing the reoccurrence of faulting once pavements are diamond ground. However, these restoration methods will not be recommended until their effectiveness is fully evaluated.

VI. PAVEMENT AND SHOULDER EVALUATION


TIOGA COUNTY
BROOME COUNTY
MM 1000
ENDICO
6.7
FASH 66-11
81
8.4 miles
FARC 60-121
82
MM 3226
3.7 miles
FARC 61-168
83
BROOME COUNTY
DELAWARE COUNTY
MM 3263
1000
DEPOSIT

AREAS INVESTIGATED



FASH 66-11, TIOGA COUNTY LINE-JOHNSON CITY
ROUTE MILE MARKER 17-9107-1000 TO 1067

PAVEMENT

Features

The PCC pavement was constructed two lanes wide in each direction. Slab lengths are 60 feet, 10 inches and the longitudinal and transverse joints were sawed contraction joints sealed with preformed neoprene. Surface texturing was done with burlap, dragged longitudinally behind the paving equipment. Since construction, the pavement surface between MM 17-9107-1038-1040 and 1047-1050, eastbound has been grooved in the longitudinal direction.

Field Observations (MM 17-9107-1024 Eastbound, MM 17-9104-1011, 1029, 1048 and 1060 Westbound)

Only minor spalling has occurred in the longitudinal and transverse joints and both joint types are about the same width as originally constructed. On the average, there is less than one transverse crack per slab. However, this is misleading, as most cracks are concentrated in a few areas and were caused by a lack of subbase support. Transverse joint faulting ranges from 3/16 to 3/8 of an inch while wheel track rutting is 1/4 to 1/2 of an inch in depth, both being predominately in the driving lanes. The large aggregate is exposed in the wheel paths, with wear being more evident in the driving lanes. The transverse joint sealers still appear to be providing adequate service but, have reached their serviceable life. Upward buckling type blowups have not occurred on this contract to date.

SHOULDER

Record Plan Details

The original shoulders were constructed of four (4) inches of Item 59WWA Bituminous Stabilized Course (including shoulders) and Item 260-Seal Coat for Stabilized Shoulders.

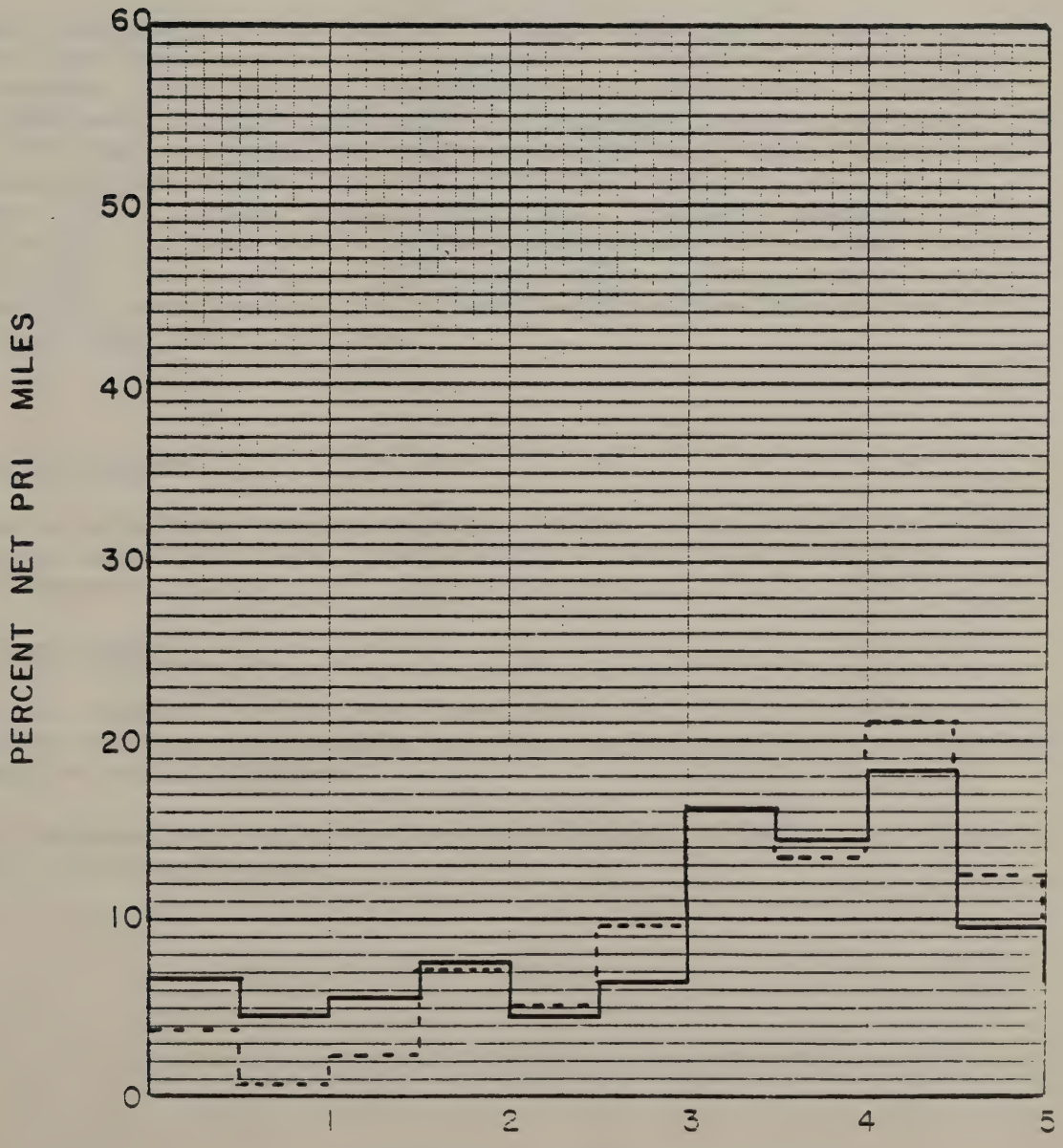
Field Observations

Both the eastbound and westbound outside shoulders are in good condition. A two (2) foot wide wedge of blacktop has been placed on the shoulder at the pavement interface. This area shows evidence of prominent cracking. Accumulations of sand along the outside edge impede the surface drainage.

The median shoulder in both the eastbound and westbound directions are in good condition. These shoulders have a one (1) foot wide wedge of blacktop at the shoulder-pavement interface which also exhibits some cracking.

DATA SHOWN			
YEAR	1981	1981	
SYMBOL	—— EB	- - - WB	
SURVEY DATE	7/2/81	7/2/81	
% MISSING PRI	0.45	1.5	
W MEAN	3.151	3.518	
POST SPEED, MPH	55	55	
PAVT. TYPE / MI	RIGID	RIGID	

9107
1000 to 1066



FASH 68-8, JOHNSON CITY-BINGHAMTON
ROUTE MILE MARKER 17-9107-1067 TO 2011

PAVEMENT

Features

The PCC pavement was constructed three lanes wide in each direction. Slab lengths are 60 feet, 10 inches and the longitudinal and transverse joints were sawed contraction joints sealed with preformed neoprene. Surface texturing was done with a stiff broom dragged across the pavement perpendicular to the flow of traffic. Since construction, short sections of the pavement surface have been grooved in the longitudinal direction.

Field Observations (MM 17-9107-1069, 1081, 1091 & 2008 Westbound, MM 17-9107-2000 Eastbound)

Only minor spalling has occurred in the longitudinal and transverse joints and both joint types are about the same width as originally constructed. On the average, there is about one transverse crack per slab. However, this is misleading as the cracks are more numerous in some areas than in others. For the most part, the cracks are narrow and tight. Transverse joint faulting ranges from 0 to about 1/2 of an inch while wheel track rutting is 1/4 of an inch in the driving lane. The large aggregate is exposed in all the lanes with wear decreasing across the pavement from the driving lane to the mall lane. The joint sealers on this contract have surpassed their serviceable life. Upward buckling type blowups have not occurred on this contract to date.

SHOULDER

Record Plan Details

The original shoulders were constructed of three (3) inches of Item 45 SP Base Course Asphalt Concrete, Type 1A with an inch (1) of Item 51 MZ Asphalt Concrete Top.

Field Observations

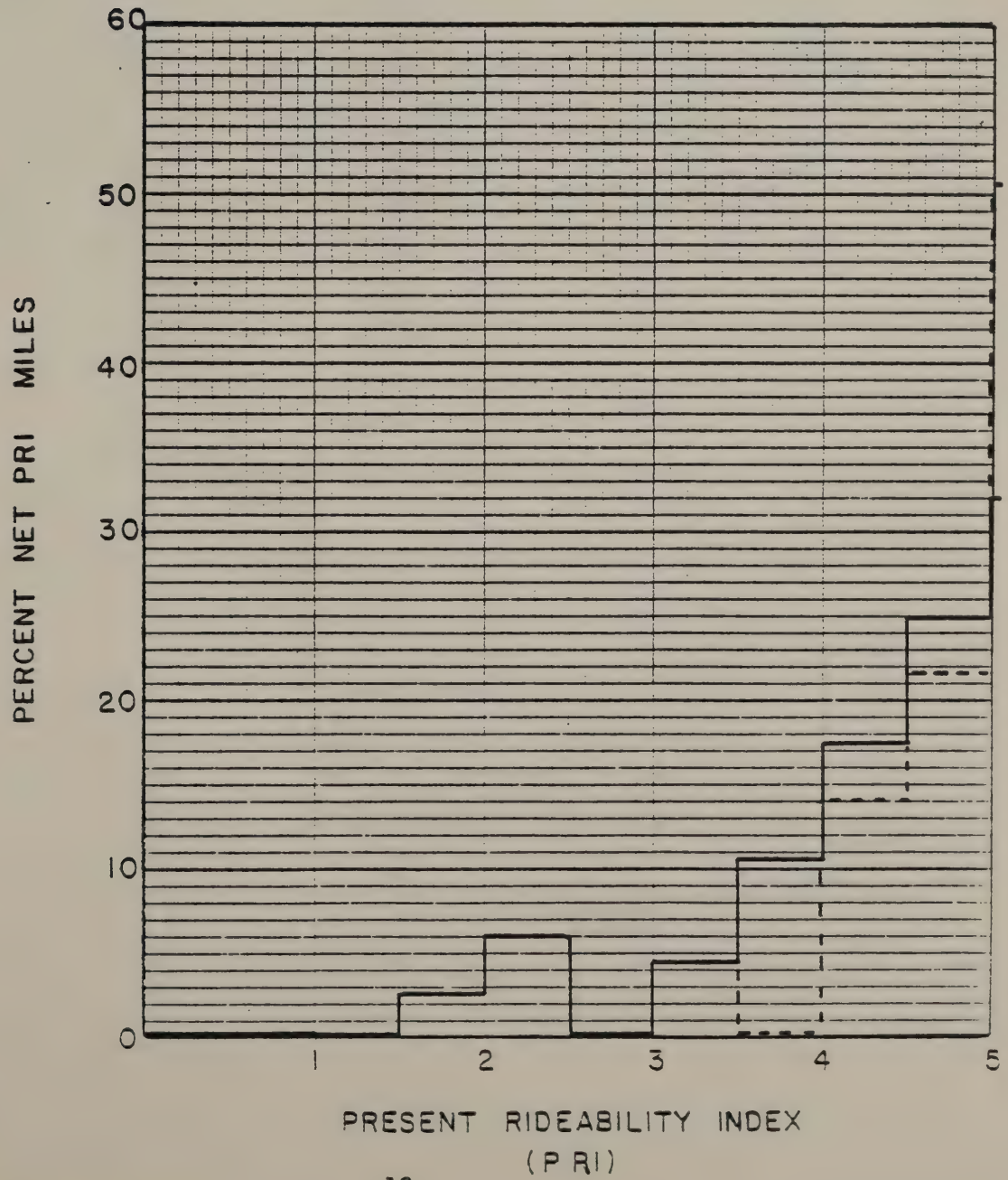
Overall the shoulders are in fairly good condition. There is evidence of a dropoff at the pavement/shoulder interface as indicated by a two (2) foot wide wedge of Asphalt Concrete.

Areas of the shoulder that do not have curbing have accumulations of sand and debris impeding drainage.

FASH 68-8

DATA SHOWN			
YEAR	1981	1981	
SYMBOL	—— EB	- - - WB	
SURVEY DATE	7/2/81	7/2/81	
% MISSING PRI	0.00	1.97	
W MEAN	4.346	4.595	
POST SPEED, MPH	55	55	
PAVT. TYPE / MI	RIGID	RIGID	

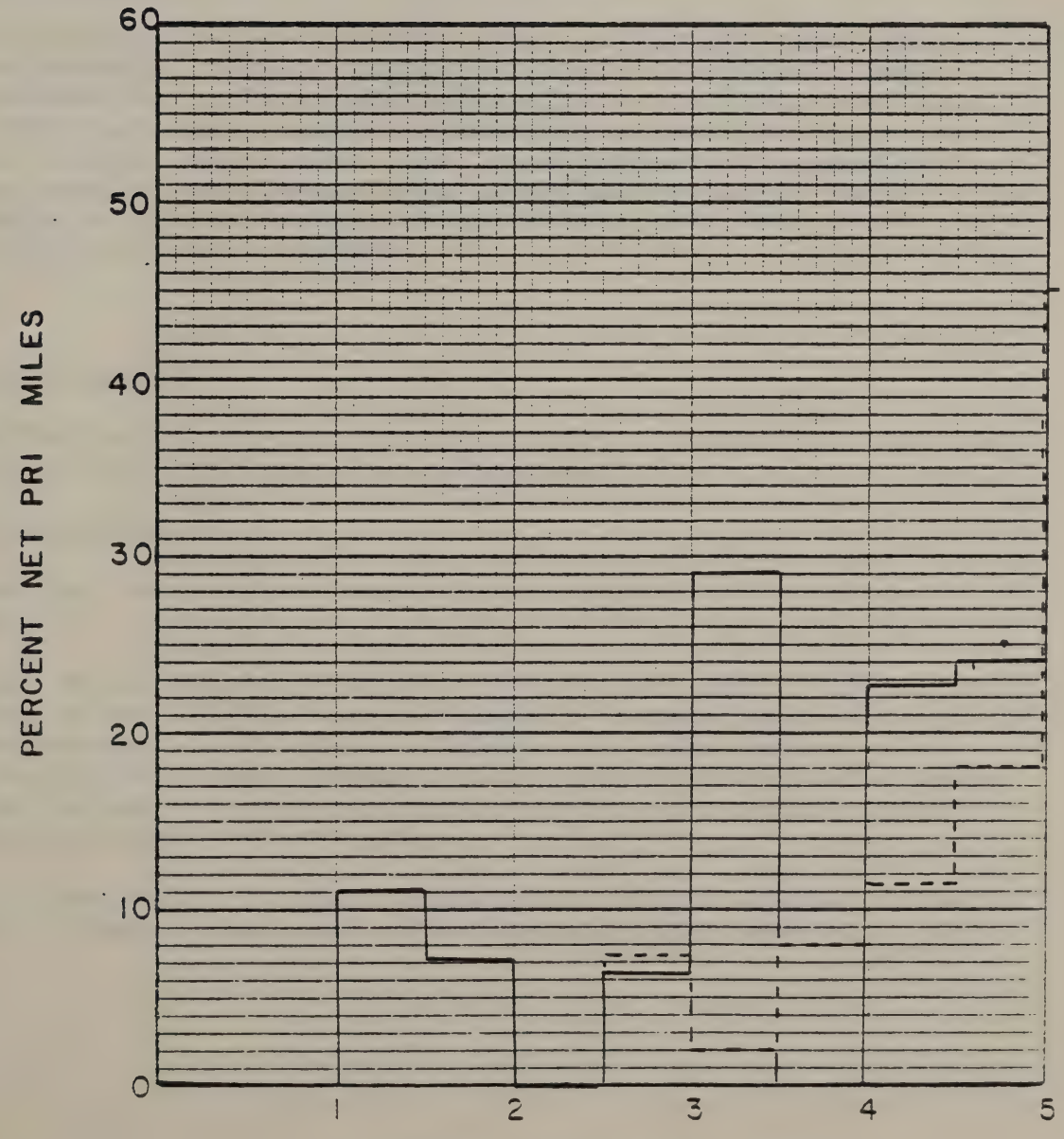
9107
1066 to 1098



FA S H 68-8

DATA SHOWN			
YEAR	1981	1981	
SYMBOL	——EB	----WB	
SURVEY DATE	7/2/81	7/2/81	
% MISSING PRI	5.86	7.98	
W MEAN	3.397	4.50	
POST SPEED, MPH	55	55	
PAVT. TYPE/MI	RIGID	RIGID	

9107
2000 to 2100



FAC 64-5, CHENANGO RIVER-MYGATT STREET
ROUTE MILE MARKER 17-9107-2011 TO 81I-9101-2025

PAVEMENT

Features

The PCC pavement was constructed three lanes wide in each direction. Slab lengths are 60 feet, 10 inches and the longitudinal and transverse joints were sawed contraction joints sealed with preformed neoprene. It appears that the original surface texturing was done with burlap, dragged longitudinally behind the paving equipment. Since construction, the surface has been grooved in the longitudinal direction between MM 17-9107-2013 and 2017, east and westbound.

Field Observations (MM 17-9107-2013 Westbound)

Both the longitudinal and transverse joints exhibit only minor spalling and are basically the same width as originally constructed. However, the preformed sealers have failed and the transverse joints have faulted about 1/4 of an inch. Transverse cracks average less than one per slab and all are fine, tight cracks. The larger aggregate is exposed in the driving lanes and to a lesser degree in the passing lanes. The mall lane is wearing in the wheel tracks. Upward buckling type blowups have not occurred on this contract to date.

SHOULDER

Record Plan Details

The original shoulders were constructed of four (4) inches of Item 59WW Bituminous Stabilized Course (including shoulders).

Field Observations

The eastbound shoulders are completely disintegrated and should be replaced.

There are varying degrees of erosion of the outside edge of the westbound shoulder. A two (2) $\pm$ foot wedge of Asphalt Concrete has been placed at the pavement-shoulder interface. Although this wedge appears to be functional there is some evidence of longitudinal cracking and alligator cracking. Accumulations of sand and debris along the outside edge of the shoulder impede surface drainage.

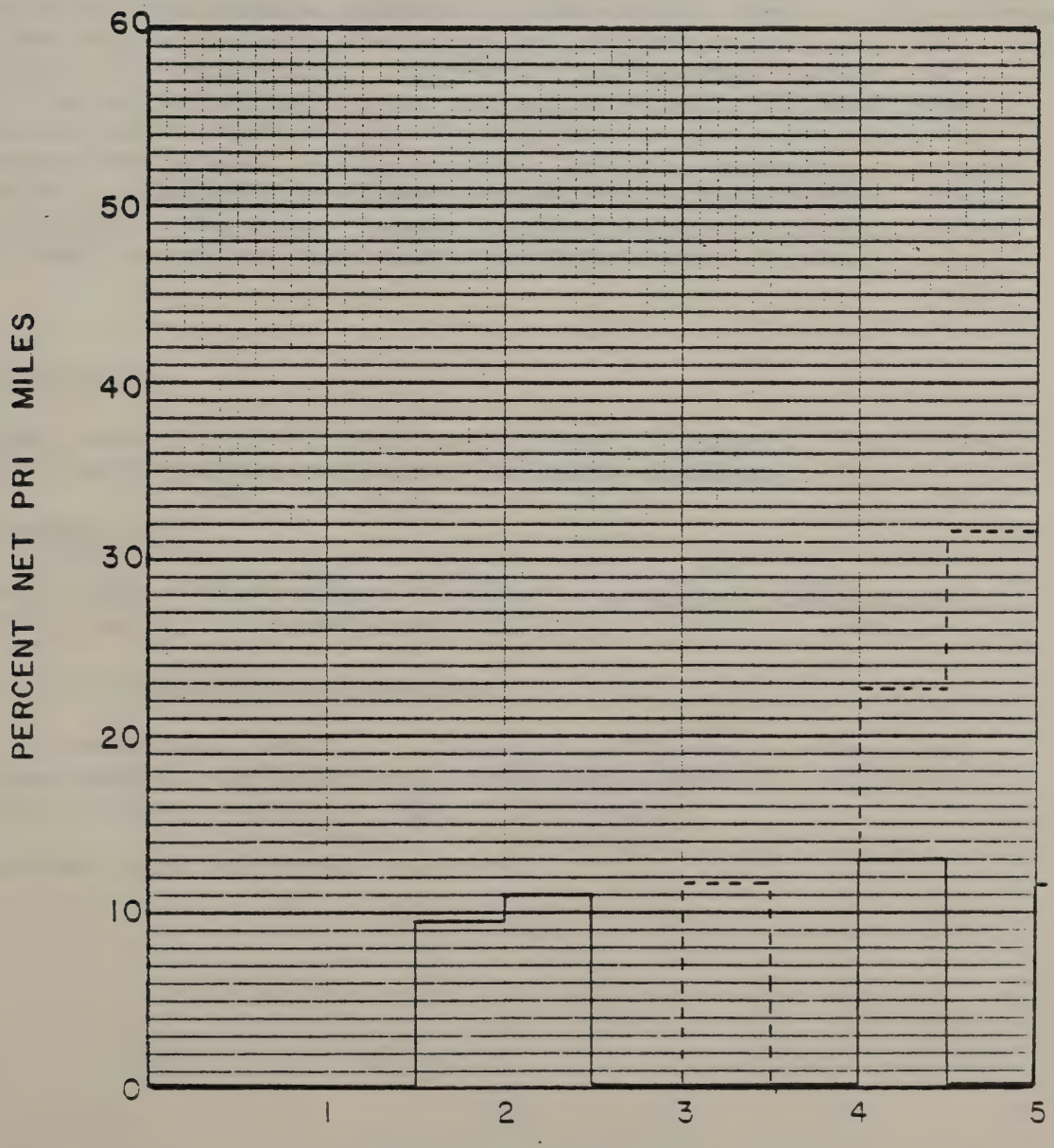
A one (1) foot wedge of Asphalt-Concrete has been placed along the median shoulder. However, this shoulder has completely disintegrated.

FIC 64-4; FAC 64-5

DATA SHOWN			
YEAR	1981	1981	
SYMBOL	—— EB	- - - WB	
SURVEY DATE	7/2/81	7/2/81	
% MISSING PRI	51 *	2.109	
W MEAN	3.483	4.592	
POST SPEED, MPH	55	55	
PAVT. TYPE / MI	RIGID	RIGID	

* NOTE PERCENT MISSING PRI DATA

9107
2010 to 2017



FIC 63-24, FIVE MILE POINT-BINGHAMTON STATE HOSPITAL
ROUTE MILE MARKER 81I-9101-2000 TO 3026

PAVEMENT

Features

On this contract, Route 17 and I81 run together. The PCC pavement was constructed three lanes wide in each direction. Slab lengths are 60 feet, 10 inches and the longitudinal and transverse joints were sawed contraction joints sealed with preformed neoprene. Surface texturing was done with burlap, dragged longitudinally behind the paving equipment.

Field Observations (MM 81I-9101-2003 and 2012 Eastbound, MM 81I-9101-2005 Westbound)

The longitudinal and transverse joints exhibit only minor spalling and are very nearly the same width as originally constructed. However, the preformed sealers are no longer sealing the joints and the transverse joints are faulted 3/8 to 3/4 of an inch. Transverse cracks average one per slab. However, this is misleading, as most are concentrated in isolated areas where lack of subbase support was evident. For the most part, the cracks can be classified as wide, working cracks. The large aggregate is exposed in the driving lanes and, to a lesser degree, in the center lanes. Wheel track rut depth in these lanes ranges from 1/8 to 3/8 of an inch. Upward buckling type blowups have not occurred on this contract to date.

SHOULDER

Record Plan Details

The original shoulders were constructed of four (4) inches of Item 59WW - Stabilized Shoulder Bituminous Course (including shoulders).

Field Observations

The easterly half of the westbound shoulder is completely disintegrated. The remainder is in fairly good condition.

The median shoulder is in good condition.

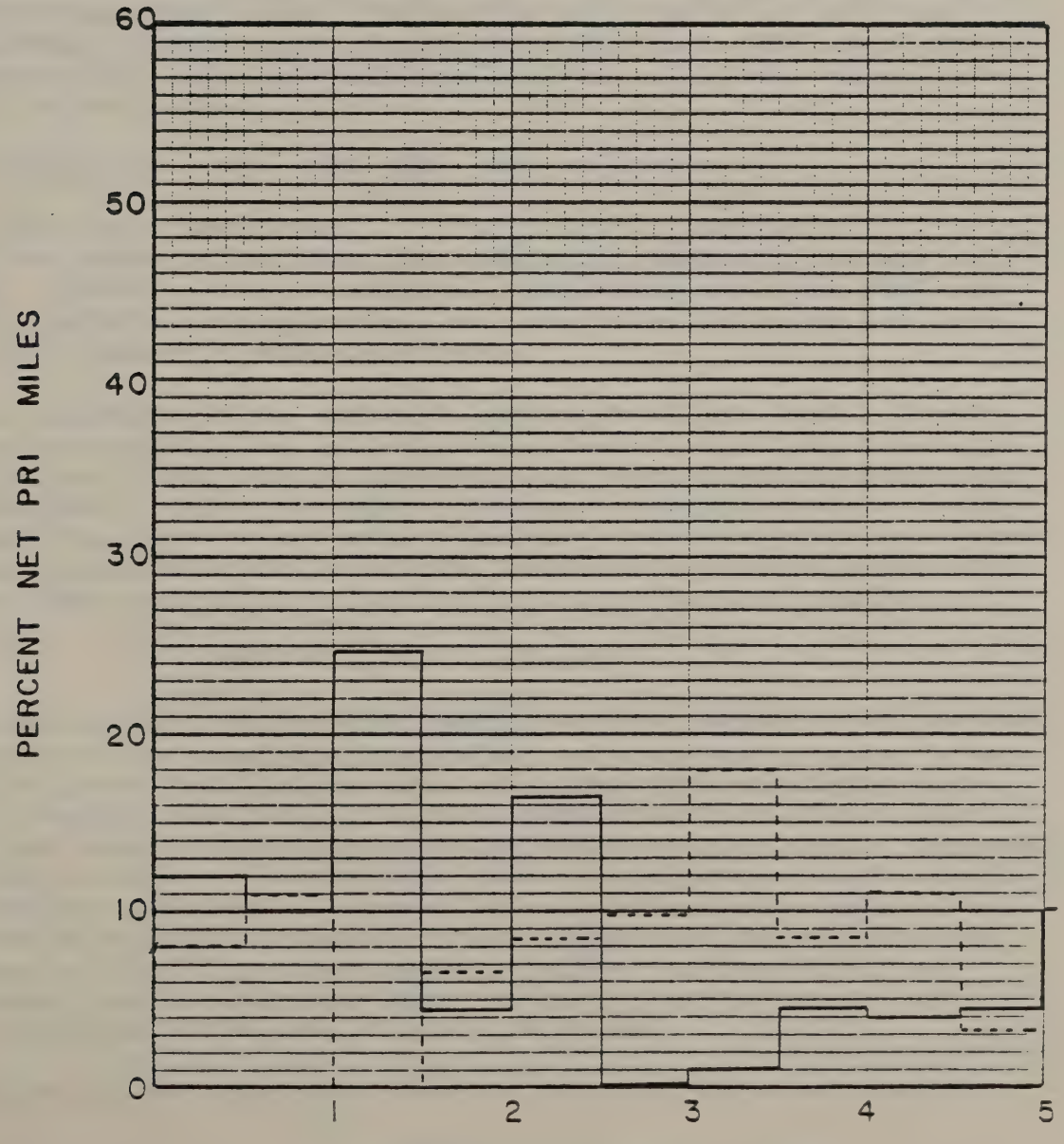
There is a considerable amount of potholes and alligator cracking along the outside shoulder with additional deterioration three (3) to four (4) feet in from the extreme outside edge of the shoulder.

The median shoulders are in fair condition.

FIC 63-24

DATA SHOWN			
YEAR	1981	1981	
SYMBOL	——EB	- - - WB	
SURVEY DATE	7/1/81	7/1/81	
% MISSING PRI	11.346	11.828	
W MEAN	2.132	2.287	
POST SPEED, MPH	55	55	
PAVT. TYPE/MI	RIGID	RIGID	

9101
2027 to 2001



FARC 53-18, BINGHAMTON-WINDSOR, PART 2
ROUTE MILE MARKER 17-9107-3026 TO 3043

PAVEMENT

Features

The PCC pavement was constructed two lanes wide in each direction. Slab lengths are 100 feet and the longitudinal and transverse joints were hand formed expansion joints sealed with a liquid sealer. Surface texturing was done with burlap, dragged longitudinally behind the paving equipment. A portion of the original pavement was resurfaced (and in some areas widened) in 1976 (FARC 75-110).

In the eastbound lanes a conventional bituminous overlay consisting of T&L, 1-1/2 inches to Type 2A Binder and 1 inch of Type 1 AF Top (high Friction) was placed. In the westbound lanes, two experimental bituminous overlay sections were placed. One section consisted of a 1 inch open graded asphalt surface course placed over a tack coat. The second was composed of T&L, 1-1/2 inches of Type 2A Binder and 1 inch of Open Graded Asphalt Surface Course.

Field Observations (MM 17-9107-3029, East and Westbound)

The 1 inch wide transverse and 3/4 of an inch wide longitudinal joints in the PCC not overlayed are wider than originally constructed and are badly spalled. There is also an average of 3 transverse cracks per slab many of which are wide, working cracks. Both the joints and cracks have been extensively patched by maintenance forces.

The large aggregate in the surface is exposed in all the lanes. However, wear is predominent in the driving lanes. Wheel track rut depth measures 3/8 of an inch in the driving lanes while rut depth was not measurable in the other lanes. Unlike the other PCC pavements evaluated in the county, the transverse joints do not exhibit faulting, indicating that these joints were most likely built with dowel type load transfer devices. Areas that have not been overlayed do not exhibit any upward buckling type blowups.

(MM 17-9107-3036 Eastbound)

In both the conventional and experimental overlays, reflection cracks have developed over the underlying longitudinal and transverse pavement joints. Reflection cracks have also developed over some of the underlying slab cracks. Many of these reflection cracks have either raveled back leaving 1 inch wide gaps or multiple cracking has occurred with pieces of the overlay being lost to traffic. Despite this, however, the pavement surface is in good condition and rides well except for an occasional minor upheaval or bump over an underlying transverse joint. Apparently, internal stresses in the underlying PCC pavement are being relieved at these locations. Wheel track ruts in the driving lanes are only 1/8 of an inch in depth while rutting has not occurred in the other lanes.

Observations of the experimental overlays during a rain storm revealed

that the open graded mixes are draining faster than the conventional mix. However, they are not draining as fast as they did when first placed as evidenced by trailing plumes of water behind vehicles passing over them. Apparently, the surfaces are becoming clogged with dirt and other foreign materials reducing their effectiveness.

SHOULDER

Record Plan Details

The original shoulders were constructed of six (6) inches of Item 259G. Calcium Chloride Treated Gravel. However, the shoulders were overlayed with asphalt in 1975.

Field Observations

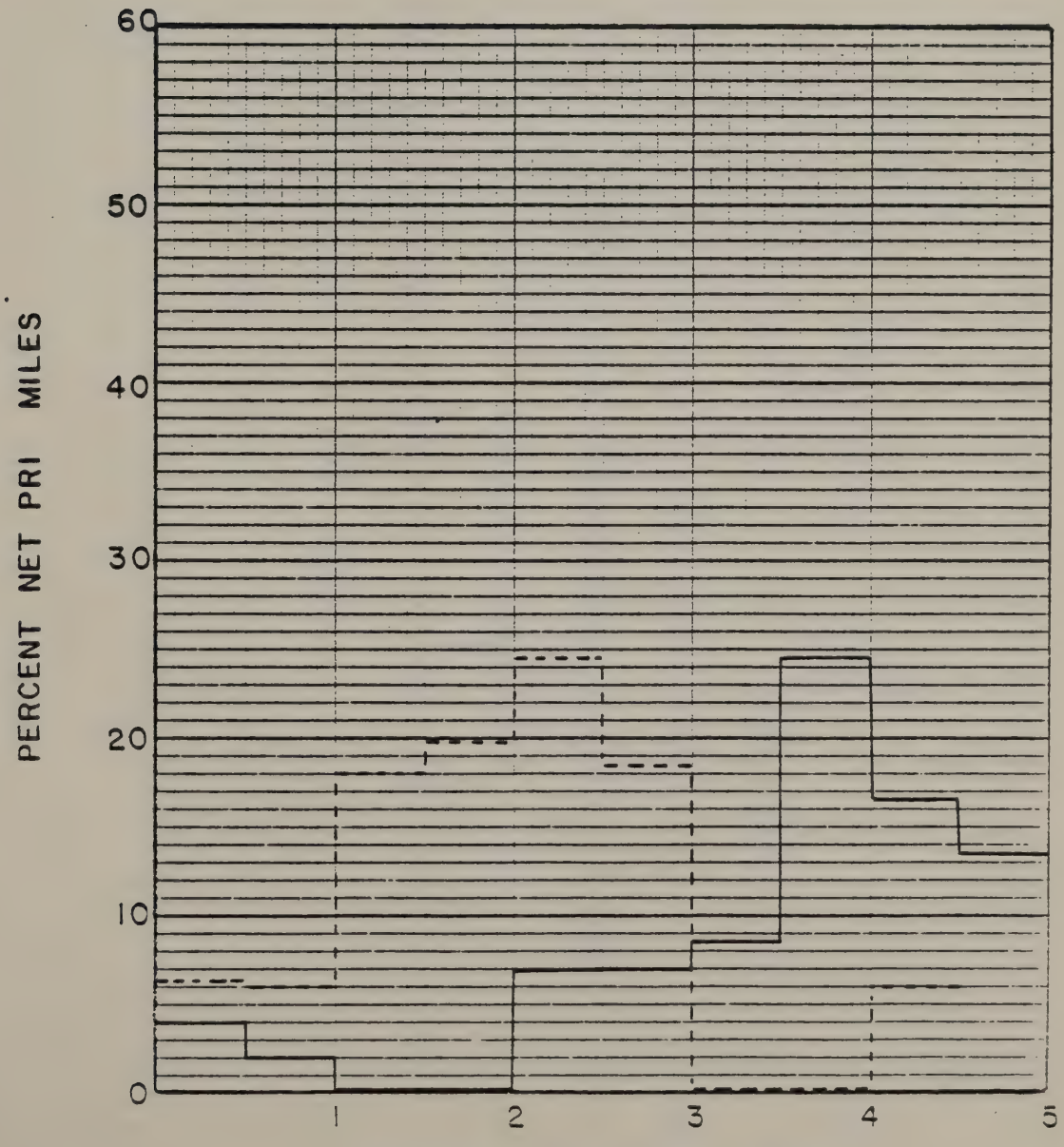
The outside shoulder is in good to excellent condition with some minor, cracking along the pavement shoulder interface.

The median shoulders are in good condition.

FARC 53-18

DATA SHOWN			
YEAR	1981	1981	
SYMBOL	—— EB	- - - WB	
SURVEY DATE	6/25/81	6/24/81	
% MISSING PRI	19.13	0.00	
W MEAN	3.760	2.030	
POST SPEED, MPH	55	55	
PAVT. TYPE / MI	RIGID	RIGID	

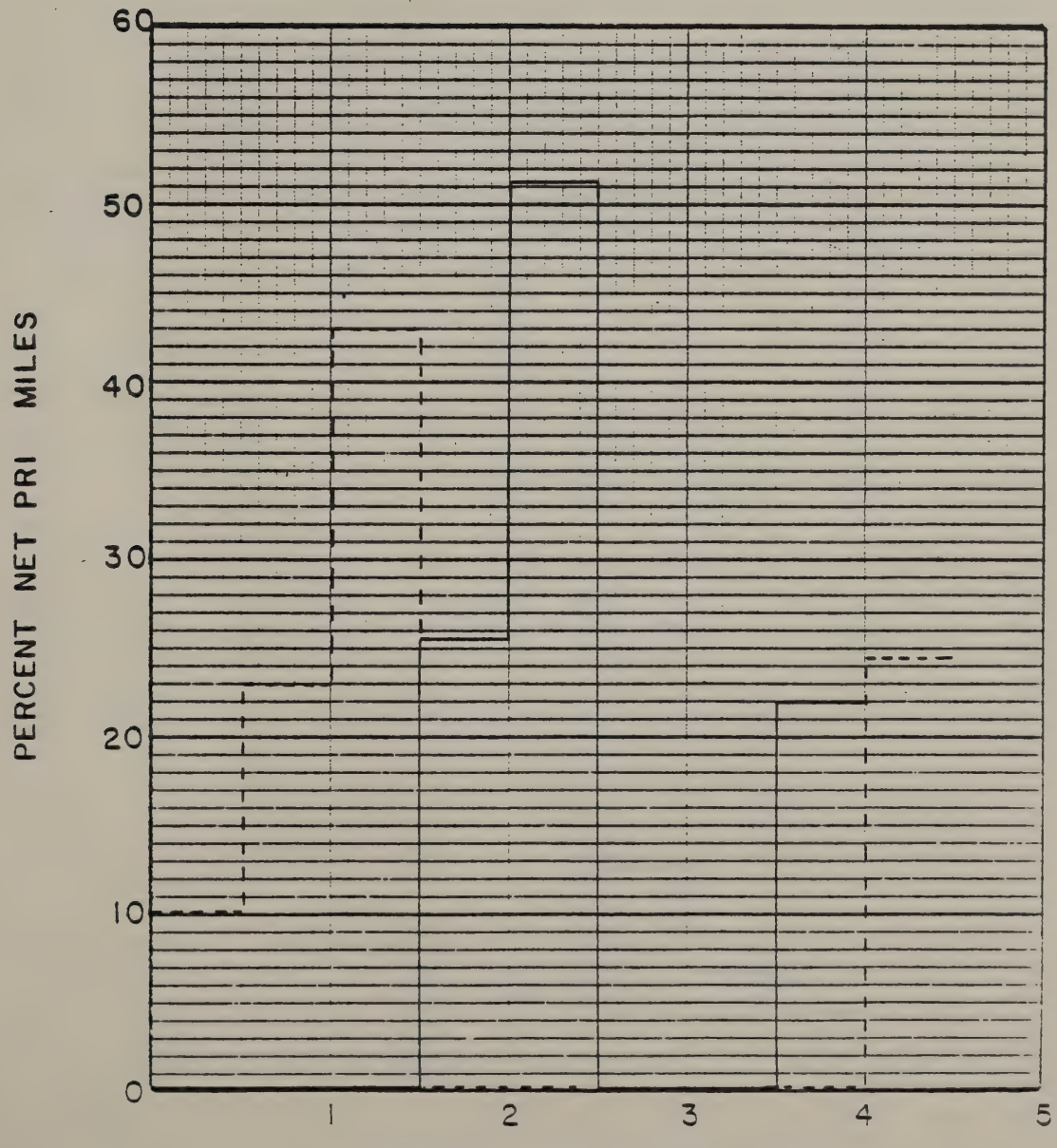
9107
3030 to 3046



FISH 61-11; FIC 61-9

DATA SHOWN			
YEAR	1981	1981	
SYMBOL	——EB	- - - WB	
SURVEY DATE	6/25/81	6/24/81	
% MISSING PRI	0.000	0.000	
W MEAN	2.510	2.025	
POST SPEED, MPH	55	55	
PAVT. TYPE / MI	RIGID	RIGID	

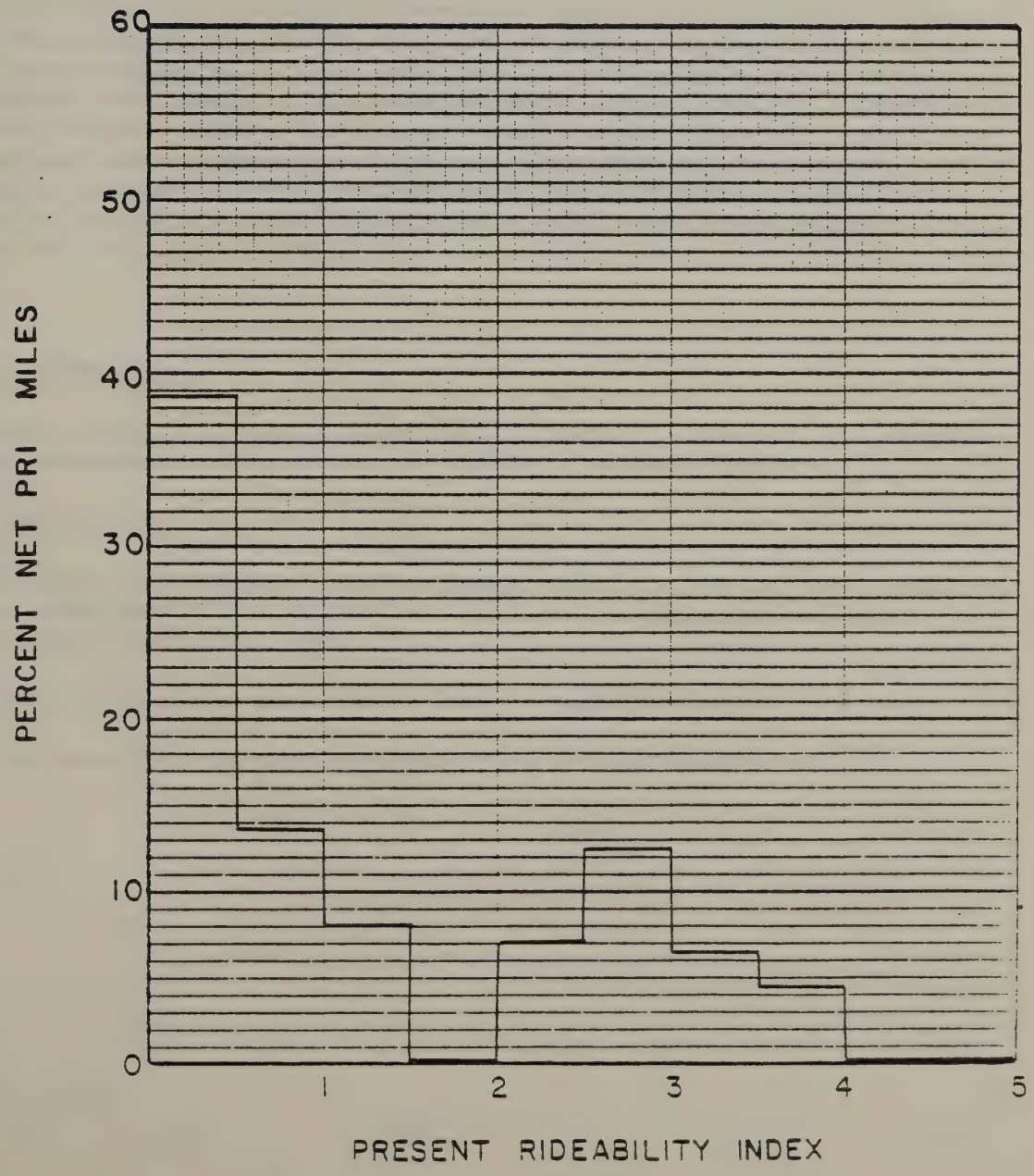
9107
3026 to3030



DIVIDED SECTION ONLY

DATA SHOWN			
YEAR	1981		
SYMBOL	——EB		
SURVEY DATE	7/1/81		
% MISSING PRI	0.00		
W MEAN	1.385		
POST SPEED, MPH	55		
PAVT. TYPE / MI	RIGID		

9101
1103 to 1084



FARC 47-19, BINGHAMTON-WINDSOR, PARTS 2 AND 3
ROUTE MILE MARKER 17-9107-3043 TO 3080

PAVEMENT

Features

The PCC pavement was constructed two lanes wide in each direction. Slab lengths are 95 feet and the longitudinal and transverse joints were hand formed expansion joints sealed with a liquid sealer. Surface texturing was done with burlap, dragged longitudinally behind the paving equipment. The original pavement was resurfaced in 1976 (FARC 75-110) with bituminous concrete. The overlay consisted of T&L, 1-1/2 inch of Type 2A Binder and 1 inch of Type 1AF Top (High Friction).

Field Observations (MM 17-9107-3055 Eastbound)

Reflection cracks have developed over the underlying longitudinal and transverse pavement joints and over some of the underlying slab cracks. Many of these reflection cracks have raveled back or multiple cracking has occurred with pieces of the overlay being lost to traffic. Despite this, the pavement surface is in good condition and rides well except for an occasional minor upheaval or bump over an underlying transverse joint. Apparently, internal stresses in the underlying PCC pavement are being relieved at these locations. Wheel track ruts in the driving lanes were 1/4 inch to 3/8 inches in depth.

SHOULDER

Record Plan Details

The original shoulders were constructed of "Earth". However, the shoulders have been overlayed with asphalt to provide a suitable surface.

Field Observations

Generally both the eastbound and westbound shoulders are in good condition with the exception of some minor and localized raveling and alligator cracking along the outside edge.

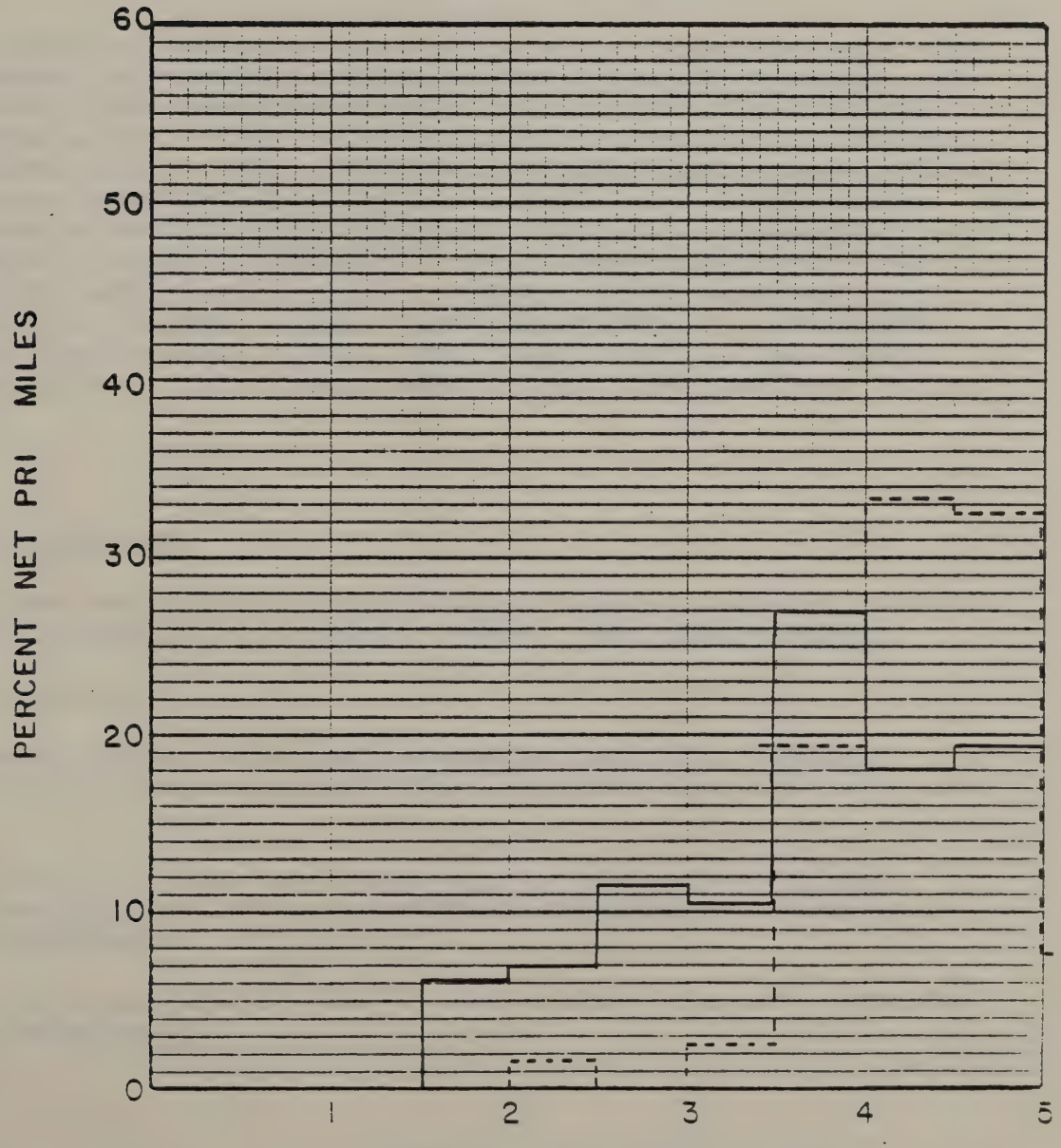
Sand accumulation along the outside edge is impeding surface drainage.

The median shoulders in both directions are in good condition.

FARC 47-19

DATA SHOWN			
YEAR	1981	1981	
SYMBOL	——EB	- - - WB	
SURVEY DATE	6/25/81	6/24/81	
% MISSING PRI	0.000	0.000	
W MEAN	3.636	4.350	
POST SPEED, MPH	55	55	
PAVT. TYPE/MI	OVER LAY	OVER LAY	

9107
3046 to 3081



FARC 59-115, BINGHAMTON-WINDSOR, PARTS 3 AND 4, WINDSOR-DEPOSIT
ROUTE MILE MARKER 17-9107-3080 TO 3142

PAVEMENT

Features

The PCC pavement was constructed two lanes wide in each direction. Slab lengths are 60 feet, 10 inches and the longitudinal and transverse joints were formed contraction joints sealed with a liquid sealer. Surface texturing was done with burlap, dragged longitudinally behind the paving equipment. Since construction, the pavement surface in both the east and westbound lanes between MM 17-9107-3103 and 3107 has been grooved in the longitudinal direction.

Field Observations (MM 17-9107-3091 and 3103 Eastbound, MM 17-9107-3109 and 3129 Westbound)

The 3/4 inch to 1 inch wide transverse joints are wider than originally constructed, badly spalled and have faulted 1/8 to 1/2 of an inch. The longitudinal joint measures 1/2 to 3/4 of an inch in width which is also wider than normal. Major spalling has also occurred at this joint and it has faulted 1/8 of an inch. Both the longitudinal and transverse joints have been extensively patched by maintenance forces. On the average, each slab contains one transverse crack half of which are wide working cracks. The larger aggregate is exposed in the surfaces of the driving lanes with wheel track ruts being 1/4 to 3/8 inch deep. In the eastbound driving lane, some of the large aggregate used was expansive as evidenced by popouts in the pavement surface. This also occurs to a lesser degree, in the passing lane. Only 1 upward buckling type blowup was found on this project.

SHOULDER

Record Plan Details

The original shoulders were constructed of three (3) inches of Item 59TA Stabilized Gravel Mixed Bituminous Treatment (including shoulders).

Field Observations

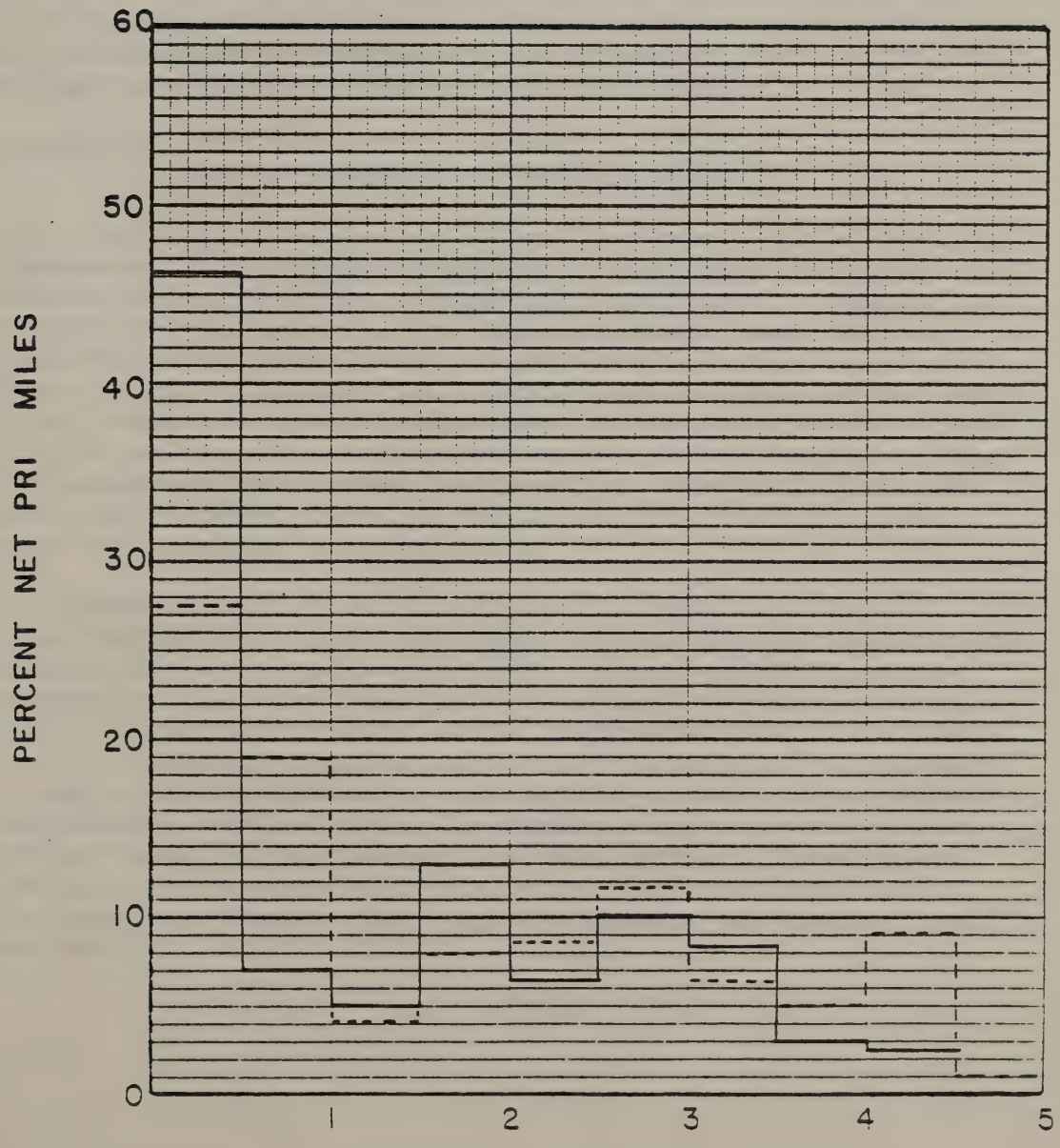
The outside shoulder is in good to excellent condition. A dropoff of one half (½) to one and one half (1½) inch exists along the inside of a curve.

Sand accumulation along the outside edge is in a surface drainage. Approximately fifty (50) percent of the median shoulder is completely disintegrated between MM3112 and 3134.

A drop off of approximately one (1) inch exists on the median shoulder between MM3080 and 3112.

DATA SHOWN			
YEAR	1981	1981	
SYMBOL	——— EB	- - - WB	
SURVEY DATE	6/25/81	6/24/81	
% MISSING PRI	0.00	0.00	
W MEAN	1.266	1.785	
POST SPEED, MPH	55	55	
PAVT. TYPE / MI	RIGID	RIGID	

9107
3081 to 3143



FARC 60-121, WINDSOR-DEPOSIT
ROUTE MILE MARKER 17-9107-3142 TO 3226

PAVEMENT

Features

The PCC pavement was constructed two lanes wide in each direction. Slab lengths are 61 feet and the longitudinal and transverse joints were sawed contraction joints sealed with a liquid sealer. Surface texturing was done with burlap, dragged longitudinally behind the paving equipment.

In 1969, under contract RC 68-47, a climbing lane was added on to the eastbound lanes. The westbound lanes were overlayed with bituminous concrete in 1979 under contract D95821 after the original PCC pavement had been broken and seated. The overlay consisted of a 1 inch minimum course of T&L, 2-1/2 inches to Type 3 Binder Course and 1-1/2 inches to Type 6F Top Course (High Friction). It was placed between MM 17-9107-3161 and 3209. In addition, the westbound lanes between MM 17-9107-3137 and 3152 have been grooved in the longitudinal direction.

Field Observations (MM 17-9107-3172 Eastbound, MM 17-9107-3184 and 3210 Westbound)

In the eastbound lanes, the longitudinal and transverse joints are badly spalled and extensive patching by maintenance forces has been necessary. Joint widths are about the same as originally constructed. However, the transverse joints have faulted 1/4 to 1/2 of an inch. Less than one transverse crack per slab was found, the majority being narrow and tight. Average wheel track rut depth in the driving lane is 1/4 of an inch and the large aggregate is exposed in this lane. Aggregate exposure is also evident in the mall lane but to a lesser degree. In that portion of the westbound lanes which has not been overlayed, the same conditions exist as noted for the eastbound lanes. In addition, four upward buckling type blowups have occurred in these lanes.

Where the bituminous overlay was placed over the broken and seated PCC pavement, reflection cracks have developed over the underlying longitudinal joint and at almost every transverse joint. At some of the transverse joints, multiple cracks have developed. Generally, the transverse cracks are 1/8 to 1/2 of an inch in width, while longitudinal cracks are about 1/4 of an inch in width. Breaking and seating the original PCC pavement prior to overlaying was expected to substantially reduce, if not eliminate, reflective cracking over underlying longitudinal and transverse joints. It was not successful in this respect, on this contract. Breaking and seating the concrete pavement will only retard the formation of the reflection cracking. Despite this crack development, the overlay itself is in good condition and rides well.

SHOULDER

Record Plan Details

The original shoulders were constructed of three (3) inches of Item 59TCM-Stabilized-Mixed Bituminous Treatment (shoulders). The eastbound shoulders were overlayed in 1969 with a minimum of three (3) inches of Item 302.01 Bituminous Stabilized Course and one (1) inch of Item 403.16, Asphalt Concrete-Type 6 Top Course.

Field Observations

The westbound shoulders are in fair to good condition. A dropoff of approximately one (1) inch exists at the pavement-shoulder interface. Sand was accumulated along the outside edge of the shoulder for a majority of this section.

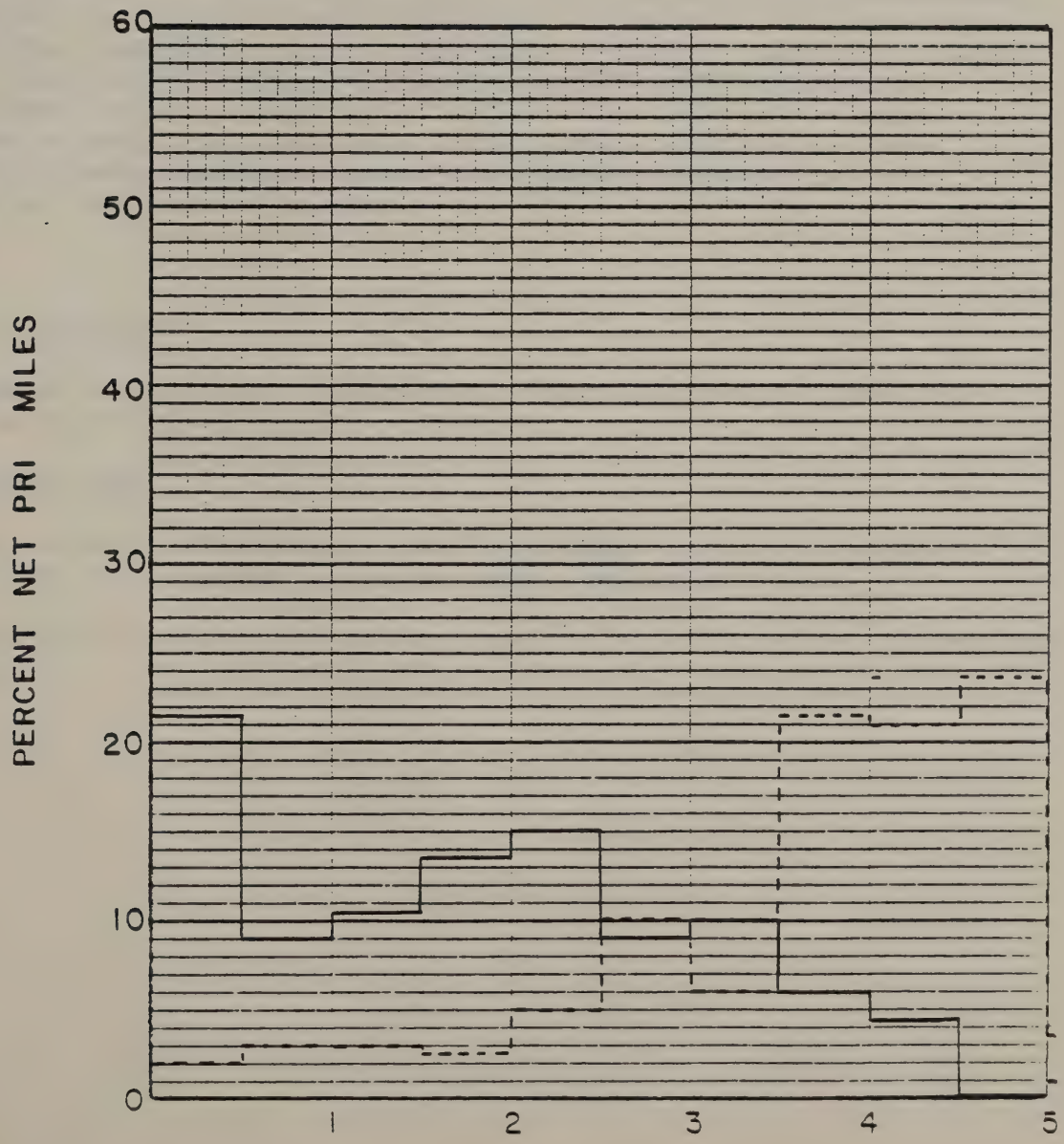
Generally the eastbound shoulder is in good shape. There is evidence of raveling along the outside edge and a dropoff of approximately one and one half (1½) inches along the pavement-shoulder interface.

The median shoulder is in poor condition with evidence of dropoff, raveling and potholes. Sand accumulation impedes drainage in some areas.

FARC 60-121

DATA SHOWN			
YEAR	1981	1981	
SYMBOL	—— EB	- - - WB	
SURVEY DATE	6/25/81	6/24/81	
% MISSING PRI	0.00	0.00	
W MEAN	1.806	3.679	
POST SPEED, MPH	55	55	
PAVT. TYPE / MI	RIGID	RIGID 3.4 OVERLAY 4.7	

9107
3143 to 3229



FARC 61-168, HALES EDDY-DEPOSIT
ROUTE MILE MARKER 17-9107-3226 TO 17-9308-1032

PAVEMENT

Features

The PCC pavement was constructed two lanes wide in each direction. Slab lengths are 60 feet, 10 inches and the longitudinal and transverse joints were sawed contraction joints sealed with preformed neoprene. Surface texturing was done with burlap, dragged longitudinally behind the paving equipment.

Field Observations (MM 17-9107-3250 and 3236 Westbound)

Only minor spalling has occurred in the longitudinal and transverse joints. Transverse joint width varies from 1/4 to 1/2 of an inch while longitudinal joint width is more consistent at 1/4 to 3/8 of an inch. On the average there is one transverse crack per slab most of which are narrow and tight cracks. Faulting of the transverse joints is 1/4 to 3/8 of an inch. Average wheel track rut depth is 1/8 to 1/4 of an inch and the large aggregate is exposed in the driving lanes. Even though the preformed neoprene no longer functions, upward buckling type blow-ups have not occurred on this contract to date.

SHOULDER

Record Plan Details

The original shoulders were constructed of four (4) inches of Item 59 W-Stabilized Gravel Mixed Bituminous Treatment.

Field Observations

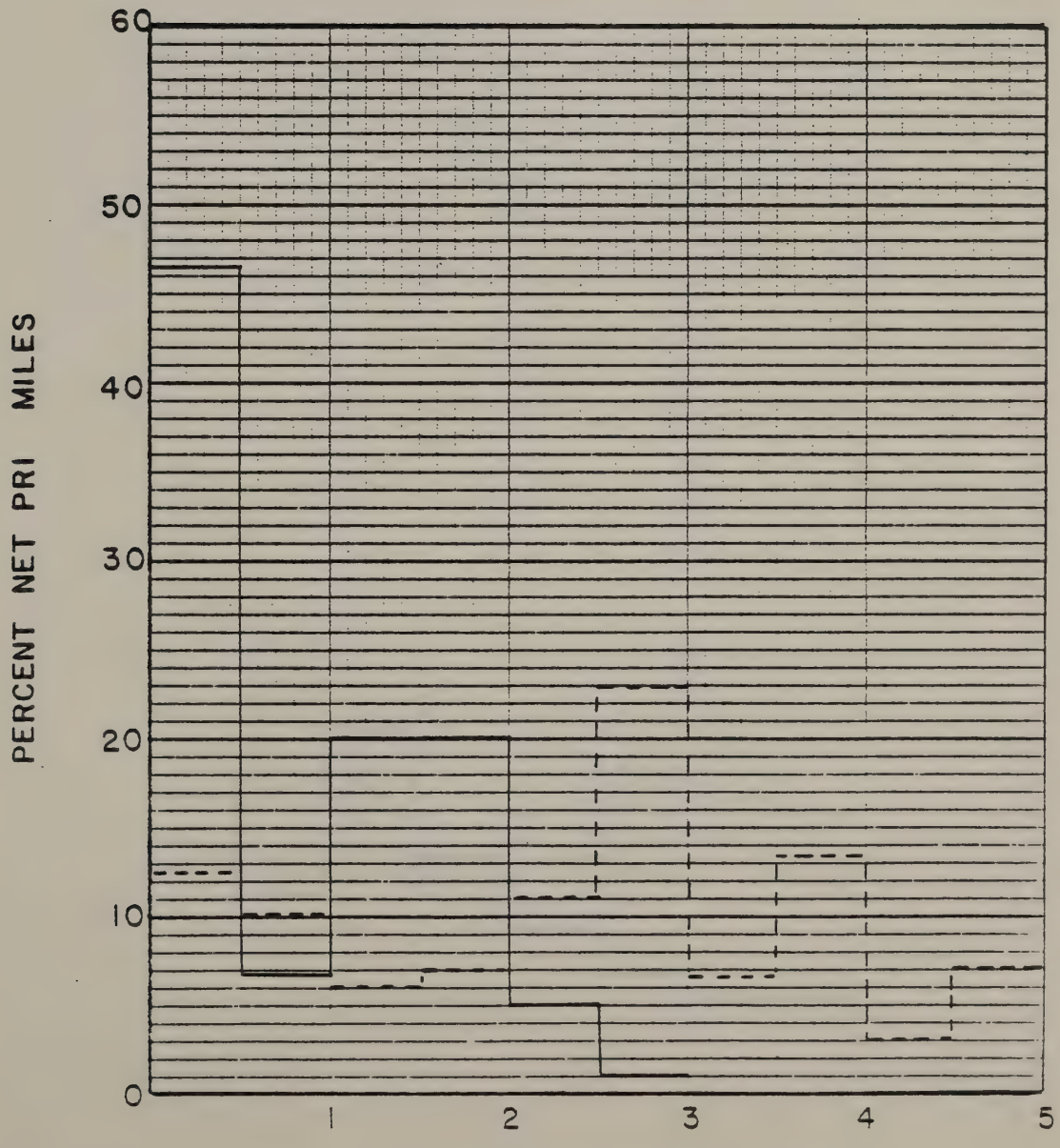
Both the eastbound and westbound outside shoulders are in good condition with a one (1) inch dropoff at the pavement shoulder interface.

Both the median shoulders are in fair condition as evidenced by intermittent raveling.

FARC 61-168

DATA SHOWN			
YEAR	1981	1981	
SYMBOL	—— EB	- - - WB	
SURVEY DATE	6/25/81	6/25/81	
% MISSING PRI	0.349	0.900	
W MEAN	0.749	2.448	
POST SPEED, MPH	55	55	
PAVT. TYPE/MI	RIGID	RIGID	

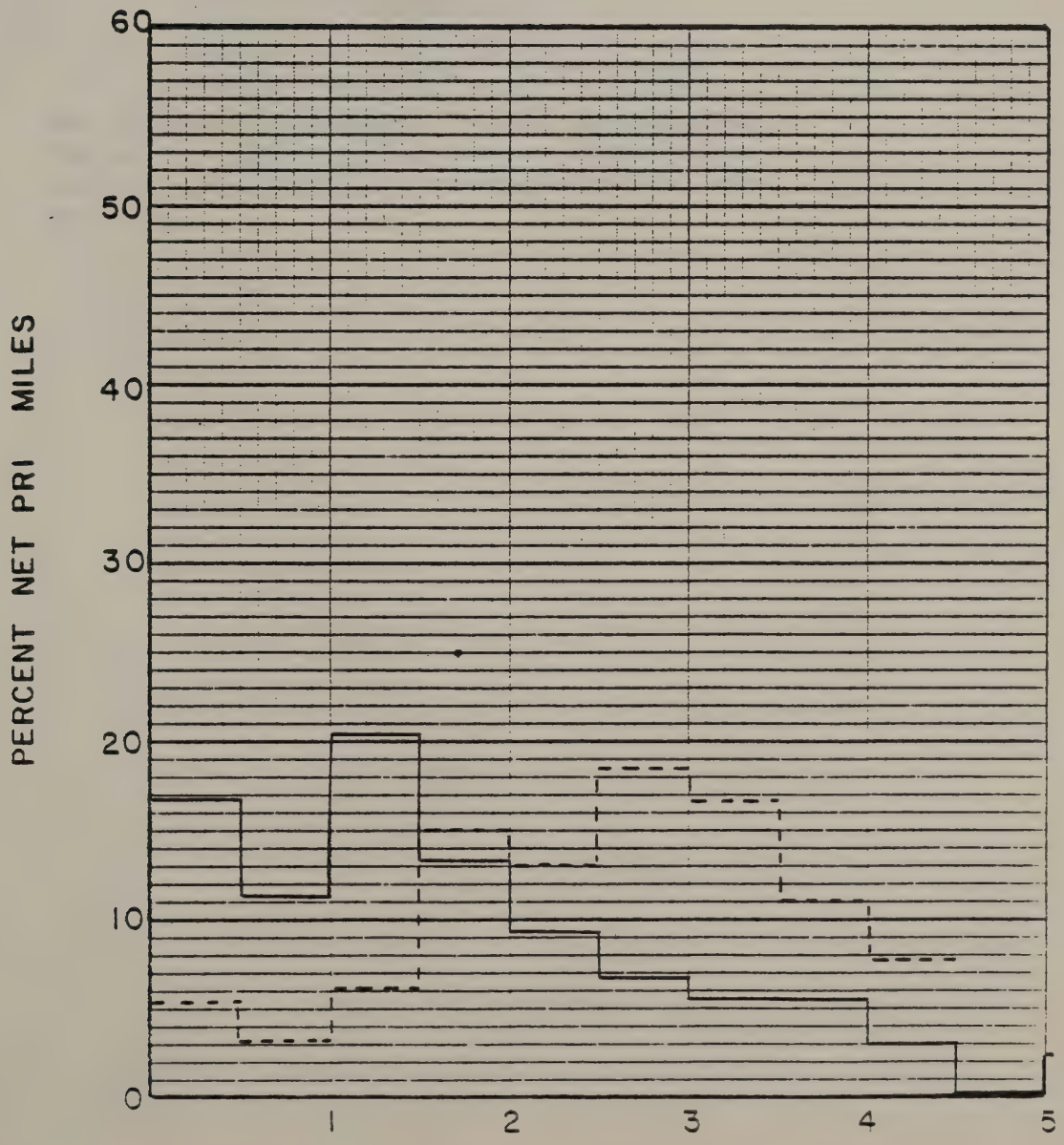
9308
1000 to 1030



FARC 61-168

DATA SHOWN			
YEAR	1981	1981	
SYMBOL	—— EB	- - - WB	
SURVEY DATE	6/25/81	6/24/81	
% MISSING PRI	0.000	0.793	
W MEAN	1.714	2.466	
POST SPEED, MPH	55	55	
PAVT. TYPE / MI	RIGID	RIGID	

9107
3229 to 3262



APPENDIX A

The captioned photographs in this Appendix depict the general deficiencies that are described in the text and were taken in both Broome and Delaware Counties.

PHOTO 1
Transverse Joint Faulting

PHOTO 2

Major Transverse Joint Spalling, Patched by Maintenance Forces.

PHOTO 3

Minor Transverse Joint Spalling

PHOTO 4

Major Longitudinal Joint Spalling, Patched by Maintenance Forces

PHOTO 5

Wide, "Working" Mid Slab Crack Which Has Faulted and Spalled

PHOTO 6

A Failed Preformed Neoprene Extrusion Lost From a Transverse Contraction Joint

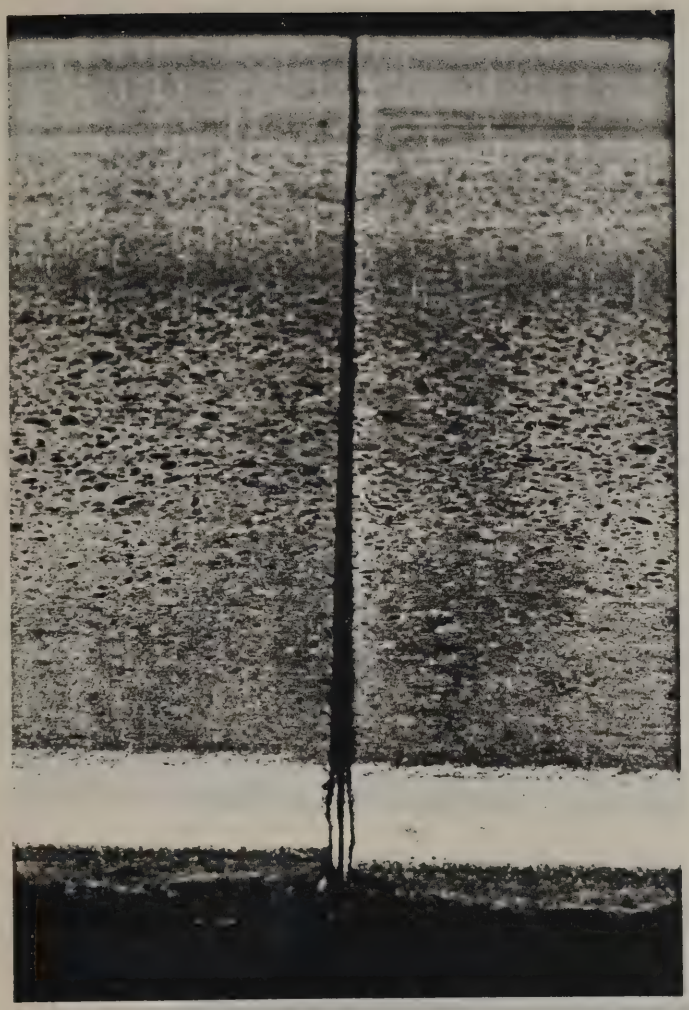


PHOTO 7

A Preformed Neoprene Extrusion
Still Sealing a Transverse
Contraction Joint

PHOTO 8

View toward oncoming traffic.
Wheel track Ruts in the Driving Lane.
Note, the Transverse Joint Faulting
that has occurred in this lane also.

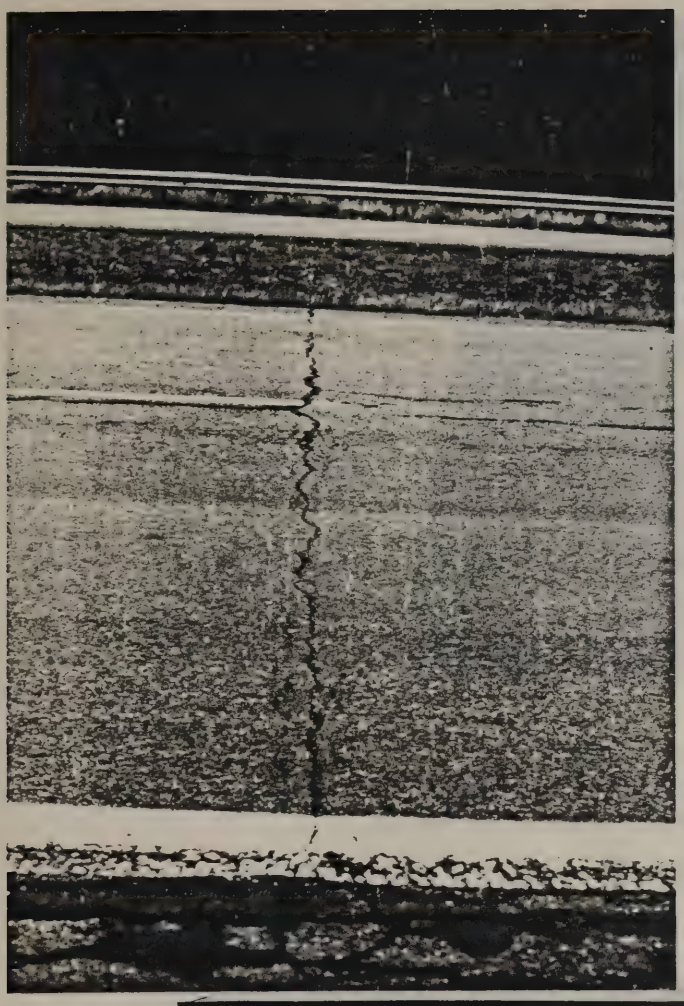


PHOTO 9

Transverse Reflective Cracking in an Asphalt Overlay

PHOTO 10

Longitudinal Reflective Cracking in an Asphalt Overlay, Patched By Maintenance Forces.

PHOTO 11
Alligator cracking and sand accumulation
along outside edge of shoulder.

PHOTO 12
Alligator Cracking

PHOTO 13
Two to three foot wide shim course
at the pavement shoulder interface.

PHOTO 14
Attempt at sealing cracks along
the pavement shoulder interface.

PHOTO 15
Completely disintegrated shoulder with
drofoff at pavement shoulder interface.

Typical cracking one to two feet
in from the pavement shoulder interface.

PHOTO 16

APPENDIX B

Geology Report

The following listing covers all of Route 17 in Broome County. Recommendations given are preliminary and additional study will be necessary at all locations where work is planned. In the event that any of these rock slopes are recut, it is recommended that the toe of slope be moved back not less then five feet to insure adequate burden for effective presplitting. Cross sections will be required for all rock slopes to be recut and it is requested that they be made available to the Soil Mechanics Bureau prior to final slope design.

In general, ditches should be kept clear of fallen rock accumulations as these tend to act as "launching pads" which may allow additional falling rock to bounce toward the pavement.

Slope stabilization recommendations are ranked by priority as follows:

A. - first consideration

B. - second consideration

C. - minimal slope work which should be done in conjunction with slope work in other areas.

ROCK SLOPES, FARC 53-18; RM 17 303.0 TO RM 17 304.6

RM 81I	EB or WB	Approx. Height	Existing Setback (edge of pavement to toe of slope)	Rock Type	Preliminary Recommendations	Remarks
110.0+	WB	25 ft.	Varies 14 to 20 ft.	Shale	Clean out ditch - slope should be recut to 1 vertical on 1 horizontal. (A)	Rock debris present in ditch - Rock fragments reach the shoulder - Raveling shale has formed undercuts and columns - Slope will continue to deteriorate.

ROCK SLOPES, FARC 53-18; RM 17 303.0 TO RM 17 304.6

RM 17	EB or WB	Approx. Height	Existing Setback (edge of pavement to toe of slope)	Rock Type	Preliminary Recommendations	Remarks
304.3+	EB	20 ft.	21 ft. at RM 304.3	Shale with minor amount of sandstone	Slope treatment not recommended If recut - design slope 1 vertical on 1 horizontal.	A few large pieces of fallen rock present in the ditch near the shoulder.

ROCK SLOPES, FARC 47-19; RM 17 304.6 TO RM 17 308.1

305.4+	EB			Shale and siltstone	Clean ditch - Slope treatment not recommended - If recut - design slope 1 vertical on 1 horizontal.	Bench at top of 20+ ft. high slope - Some fallen rock debris in the ditch.

ROCK SLOPES, FARC 59-115; RM 17 308.1 TO RM 17 314.3 Broome

RM 17	EB or WB	Approx. Height	Existing Setback (edge of pavement to toe of slope)	Rock Type	Preliminary Recommendations	Remarks
311.1+	EB	15 ft.	25 ft. at RM 311.1	Shale and siltstone	Clean ditch - A few loose blocks of rock should be scaled from the slope - If recut - design slope 1 vertical on 1 horizontal. (C)	Bench at top of 15+ ft. high slope - Rock debris present in the ditch - Raveling shale is undercutting siltstone.
311.25+	EB	10 ft.	21 ft. at RM 311.25	Shale and siltstone	Clean ditch - Slope treatment not recommended - If recut - design 1 vertical on 1 horizontal.	Bench at top of 10+ ft. high slope.

ROCK SLOPES, FARC 59-115; RM 17 308.1 TO RM 17 314.3

314.2+	EB	20 ft.	18 ft. at RM 314.2	Shale and siltstone	Clean ditch - Slope treatment not recommended - If recut - design slope 3 vertical on 2 horizontal	Roadway and rock cut located above subject slope - Shale raveling into the ditch.

ROCK SLOPES, FARC 60-121, RM 17 314.3 TO RM 17 322.9 Broome

RM 17	EB or WB	Approx. Height	Existing Setback (edge of pavement to toe of slope)	Rock Type	Preliminary Recommendations	Remarks
316.5±	WB	35 ft.	34 ft. at RM 316.45±	Siltstone & Shale	Clean ditch - Minimum treatment requires extensive scaling with blasting - It would be best to recut slope to 1 vertical on 1 horizontal. (B)	Two rock slides plus much rock debris in ditch - Slope weathering badly - Some large rock falls will come out of upper slope with continued weathering.
316.5±	EB	20 ft.	23 ft. at RM 316.5	Siltstone and shale	Clean ditch - Slope treatment not recommended. If recut design slope 3 vertical on 2 horizontal.	Some raveled shale in ditch - Road at top of slope.

ROCK SLOPES, FARC 60-121; RM 17 314.3 TO RM 17 322.9

316.9±	EB	40 ft.	(varies) 31 ft. to 37 ft.	Shale and siltstone	Clean ditch - Overhangs and columns should be removed - Slope scaling should be done. (B)	Two rock slides plus numerous large pieces in the ditch - some small rock on the shoulder - Shale is raveling and undercutting siltstone.

ROCK SLOPES, FARC 60-121, RM 17 314.3 TO RM 17 322.9 (continued)

RM 17	EB or WB	Approx. Height	Existing Setback (edge of pavement to toe of slope)	Rock Type	Preliminary Recommendations	Remarks
317.3+	EB	25 ft.	23 ft. at RM 317.3	Sandstone, Siltstone	Columns and overhangs should be removed and slope should be scaled. If recut design slope 3 vertical on 2 horizontal. (B)	Bench at top of 25+ ft. slope - one small rock slide plus rock debris in the ditch - Shale is raveling and undermining the sandstone and siltstone.
317.3+ (mallside)	EB	10 ft.	33 ft. on RM 317.3	Sandstone & siltstone with minor shale.	Clean ditch - No slope treatment recommended.	Some rock debris present in the ditch.
317.4+ (mallside)	WB	15 ft.	22 ft. at RM 317.4	Sandstone & siltstone	Clean ditch - Scale loose rock from slope - If recut design slope 3 vertical on 1 horizontal. (C)	Some rock debris present in the ditch.
318.6+	EB	35 ft.	31 ft. at RM 318.6	Shale, Siltstone & sandstone	Clean ditch - Slope treatment not recommended.	Some rock debris present in the ditch.

ROCK SLOPES, FARC 61-168, RM 17 322.9 TO RM 17 326.3 Broome

RM 17	EB or WB	Approx. Height	Existing Setback (edge of pavement to toe of slope)	Rock Type	Preliminary Recommendations	Remarks
324.2±	WB	20 ft.	30± ft.	Sandstone - Shale east	Clean ditch - Scale minor loose rock (C)	Minor fallen rock debris in the ditch.
325.6±	EB	15 ft.	23 ft. at RM 325.6	Siltstone Sandstone, some shale.	Clean ditch - Scale a few rock columns - If recut design slope 3 vertical on 1 horizontal. (C)	Some fallen rock debris in the ditch.
326.1±	WB	60 ft.	23 ft. at RM 326.1	Sandstone, Siltstone, some shale.	Clean ditch - Scale a few areas of loose rock - If recut design slope 3 vertical on 1 horizontal.	Fallen rock debris in ditch - Some pieces near the pavement edge - Bench at top of 40± ft. lower slope.
316.1±	EB	60 ft.	26 ft. at RM 326.1	Sandstone, Siltstone, some shale.	Clean ditch - Scale a few areas of loose rock. If recut design slope 3 vertical on 1 horizontal. (C)	Fallen rock debris in the ditch - Bench at top of 40± ft. lower slope.

ROCK SLOPES, FIC 64-4, FAC 64-5; RM 17 201.0 TO RM 81I 202.7 Broome

201.56±	WB	70 ft.	45± ft.	Shale	None	Some raveling of shale and debris along toe of slope.

ROCK SLOPES, FIC 63-24; RM 81I 202.7 TO RM 81I 200.1

RM 17	EB or WB	Approx. Height	Existing Setback (edge of pavement) to toe of slope)	Rock Type	Preliminary Recommendations	Remarks
200.1±	WB	8 ft.	15 ft. at RM 200.1	Shale and siltstone	Clean out ditch - If recut design slope 1 vertical on 1 horizontal.	Rock debris fills ditch and a few pieces have rolled onto the edge of shoulder.

ROCK SLOPES, FISH 61-11; FIC 61-9; RM 81I 200.1 TO RM 17 303.0

110.3±	WB	15 ft.	19 ft. at RM 110.3	Shale and siltstone	Clean out ditch - Slope should be recut to 1 vertical on 1 horizontal. (B)	Rock debris present in ditch - Some large pieces have reached the guide rail - Raveling shale has formed some undercuts and columns - Slope will continue to weather.

ROCK SLOPES, FISH 61-11; FIC 61-9; RM 81I 200.1 TO RM 17 303.0

110.0±	WB	25 ft.	Varies 14 to 20 ft.	Shale	Clean out ditch - slope should be recut to 1 vertical on 1 horizontal. (A)	Rock debris present in ditch - Rock fragments reach the shoulder - raveling shale has formed undercuts and columns - Slope will continue to deteriorate.

APPENDIX C

Shoulder Core Descriptions

FASH 66-11
TIOGA CO. LINE - JOHNSON CITY

1. EB MM 9107 - 1010 EB

   Five (5) inches of blacktop over gravel.

2. WB MM 9107 - 1030

   Five (5) inches of blacktop over gravel.

FASH 68-8
JOHNSON CITY - BINGHAMTON

3. EB MM 9107 - 1069

   Five and one half (5½) inches of blacktop over gravel.

4. WB MM 9107 - 1072

   Five (5) inches of blacktop over gravel.

5. WB MM 9107 - 2001

   Four (4) inches of blackout over blacktop.

6. WB MM 9107 - 2004

   Four and three-quarter (4 3/4) inches of blacktop over gravel.

FAC - 64-45
CHENANGO RIVER - MYGATT ST.

7. WB MM 9107 - 2012

   Three (3) inches of stabilized gravel over gravel.

8. EB MM 9107 - 2013

   Seven (7) inches of unstabilized gravel.

FIC 63-24
BINGHAMTON STATE HOSPITAL - CHENANGO RIVER

9. WB MM 9107 - 2036

   An asphalt seal coat over three inches of stabilized gravel over gravel.

10. EB MM 9107 - 2037

    One half (½) of asphalt seal coat over three and one half (3½) inches of stabilized gravel over gravel.

FISH 63-24
FIVE MILE PT. - BINGHAMTON STATE HOSPITAL

11. EB MM 9107 - 3001

    Three (3) inches of stabilized gravel over gravel.

12. WB MM 9107 - 3013

    Four and one half (4½) inches of stabilized gravel over gravel.

FARC 53-18
BINGHAMTON - WINDSOR

13. EB MM 9107 - 3032

    One and one half (1½) inches of stabilized gravel over gravel.

14. WB MM 9107 - 3033

    Six and one-quarter (6¼) inches of blacktop over gravel.

15. WB MM 9107 - 3034

    Six (6) inches of blacktop over gravel.

FARC 47-19
BINGHAMTON - WINDSOR

16. EB MM 9107 - 3055

One and one-quarter (1¼) inches of blacktop over two and three-quarter (2 3/4) inches of stabilized gravel.

17. WB MM 9107 - 3059

One inch (1) of blacktop over three and one-quarter (3¼) inches of stabilized gravel over gravel.

FARC 59-115
BINGHAMTON - WINDSOR

18. EB MM 9107 - 3096

One (1) inch of blacktop over two and one-half (2½) inches of stabilized gravel over gravel.

19. WB MM 9107 - 3097

One and one-half (1½) inches of blacktop over three and one-half (3½) inches of stabilized gravel over gravel.

FARC 60-121
WINDSOR - DEPOSIT

20. WB MM 9101 - 3203

One (1) inch of blacktop over three (3) inches of stabilized gravel over gravel.

21. WB MM 9107 - 3216

Four and one-half (4½) inches of stabilized gravel over gravel.

FARC 60-121
WINDSOR - DEPOSIT

22. EB MM 9107 - 3171

A seal coat over three and three-quarters (3 3/4) inches of stabilized gravel over gravel.

FARC 61-168
WINDSOR - DEPOSIT

23. WB MM 9107 - 3237

One-half (½) inch of seal coat over three and three-quarter (3 3/4) inches of stabilized gravel over gravel.

24. EB MM 9107 - 3247

A seal coat over four (4) inches of stabilized gravel over gravel.

00372
LRI